MOE/CAEAL
INTERLABORATORY STUDY

REPORT ON THE PREPARATION AND SUBMISSION OF SAMPLES FOR BOD, SUSPENDED SOLIDS, PH AND PHOSPHORUS

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REPORT ON THE PREPARATION AND SUBMISSION OF SAMPLES FOR BOD, SUSPENDED SOLIDS, PH AND PHOSPHORUS

Report prepared by the:

Wastewater Technology Centre,
National Water Research Institute
and the
Canadian Association of Environmental
Analytical Laboratories

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THE MOE/CAEAL INTERLABORATORY STUDY

Report on the Preparation and Submission of Samples For BOD, Suspended Solids, Ph and Phosphorous

Abstract

This interlaboratory study was commissioned by the Ontario Ministry of the Environment (MOE) under RAC Project #514G to evaluate the capability of labs to measure the common sewer-use parameters; biochemical oxygen demand, suspended solids, pH and phosphorus.

The overall administration of the study was carried out by the Canadian Association of Environmental Analytical Laboratories (CAEAL). The technical aspects of the study including sample preparation, sample distribution, and data evaluation were carried out by the Wastewater Technology Centre (WTC) and the National Water Research Institute (NWRI). This report describes the interlaboratory study carried out by the WTC and NWRI under CAEAL contract number 90-504, to assess biochemical oxygen demand, suspended solids, pH and total phosphorus.

We approached this study with two objectives in mind. The first was to assess the relative performance of the labs with respect to the accuracy and precision of their suspended solids, BOD, pH and phosphorus results. The second was to identify deficiencies in specific analytical methods, where possible, within the limits of the experimental design.

Ninety two laboratories participated in the study. Of these, 52 were provincial, municipal or regional goverment facilities. The provincial labs were, in most cases, sewage treatment plant laboratories. The remaining 40 participants were commercial, industrial or university facilities.

The overall response from participating laboratories was about 90%. The data were reviewed with regards precision, accuracy and bias with conclusions and recommendations on the current state of laboratory performance.

TABLE OF CONTENTS

i. Acknowledgements
ii. List of Tables and Figures
iii.Abbreviations

1.0 EXECUTIVE SUMMARY

2.0 INTRODUCTION

3.0 TECHNICAL APPROACH

3.1 STUDY DESIGN

3.2 PREPARATION OF REFERENCE MATERIALS
3.2.1 Preparation of BOD and Suspended Solids Standards
3.2.2 Preparation of pH Samples
3.2.3 Preparation of Total Phosphorus Standards

3.3 DATA EVALUATION
3.3.1 Ranking to Discern Bias
3.3.2 Flagging Results
3.3.3 Performance within a Study
3.3.4 Appraisals
3.3.5 Evaluation of Lab Performance on Duplicate Pairs

4.0 RESULTS AND DISCUSSION

4.1 SUMMARY OF LAB PARTICIPATION

4.2 VERIFICATION OF REFERENCE MATERIAL CONTENT
4.2.1 Suspended Solids
4.2.2 BOD
4.2.3 PH
4.2.4 Phosphorus

4.3 SUMMARY OF RESULTS FROM PARTICIPATING LABORATORIES

4.4 ASSESSMENT OF LABORATORY PERFORMANCE
4.4.1 Discerning Bias
4.4.2 Assigning Flags
4.4.3 Laboratory-Specific Appraisals
4.4.3.1 Graphical Illustration of Results
4.4.3.2 Evaluation of Individual Lab Performance
4.4.4 Comparison of Commercial and Non Commercial Lab Performance
4.4.5 Lab Performance with Duplicate Pairs

4.5 PRECISION ACHIEVABLE BY PARTICIPATING LABORATORIES

5.0 CONCLUSIONS AND RECOMMENDATIONS

6.0 REFERENCES

7.0 APPENDICES

Appendix 1: List of Participants
Appendix 2: Summary of data for all parameters
Appendix 3: Youden assessments (Bias and Flag assignments)
Appendix 4: Comparison of laboratory performance
Appendix 5: Laboratory specific appraisals
Appendix 6: Graphics output
Appendix 7: Comparison of commercial and non commercial labs
Appendix 8: Correspondence with laboratories

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ii. List of Tables and Figures:

Table 1: Reagents used to prepare synthetic pH standards
Table 2: Reagents used for the preparation of phosphorus standards
Table 3: Summary of laboratory participation
Table 4: Verification of pH standards
Table 5: Verification of total phosphorus standards
Table 6: Summary of results
Table 7: Overview of laboratory performance
Table 8: Comparison of frequency of flags and bias between commercial and non commercial labs
Table 9: Comparison of the performance of commercial and non commercial labs
Table 10: Summary of between-duplicate standard deviations
Table 11: Precision achievable by participating laboratories

Figure 1: Typical examples of laboratory performance
Figure 2: Comparison of measured suspended solids for sample SS1 with bottle number
Figure 3: Comparison of measured BOD for sample BOD1 with bottle number
Figure 4: Measured results for sample PH6 as a function of time between shipping date and analysis date
Figure 5: Ratio of values obtained for samples PH6 and PH5 versus time elapsed before analysis
Figure 6: Plot of the duplicate pairs for suspended solids
Figure 7: Plot of the duplicate pairs for BOD
Figure 8: Plot of the duplicate pairs for phosphorus
Figure 9: Comparison of results obtained with two standard samples having similar pH values
Figure 10: The precision function for suspended solids
Figure 11: The precision function for BOD
Figure 12: The precision function for pH
Figure 13: The precision function for phosphorus

iii. Abbreviations

WTC:	Wastewater Technology Centre
NWRI:	National Water Research Institute
NWQL:	National Water Quality Laboratory
CAEAL:	Canadian Association of Environmental Analytical Laboratories
MOE:	Ministry of the Environment, Ontario
USEPA:	U.S. Environmental Protection Agency
BOD:	biochemical oxygen demand
STP:	sewage treatment plant
WPCP:	water pollution control plant (STP)
mg/L	milligram/litre (ppm)
g:	grams
Kg:	kilograms
Milli-Q:	water purification system marketed by Millipore, produces 18 megaohm water
BAE:	basic acceptable error
LLBAE:	lower limit for use of basic acceptable error
CEI:	concentration error increment
Phosphorus:	Refers in this report to total phosphorus

1.0 EXECUTIVE SUMMARY

Background

This interlaboratory study was commissioned by the Ontario Ministry of the Environment (MOE) to evaluate the capability of labs to measure the common sewer-use parameters; biochemical oxygen demand, suspended solids, pH, phosphorus and metals.

The overall administration of the study was carried out by the Canadian Association of Environmental Analytical Laboratories (CAEAL). The technical aspects of the study including sample preparation, sample distribution, and data evaluation for the first four parameters were carried out by the Wastewater Technology Centre (WTC) and the National Water Research Institute (NWRI). The metals portion of the study was carried out by the National Research Council (NRC). This report describes the interlaboratory study carried out by the WTC and NWRI under CAEAL contract number 90-504, to assess biochemical oxygen demand, suspended solids, pH and total phosphorus.

We approached this study with two objectives in mind. The first was to assess the relative performance of the labs with respect to the accuracy and precision of their suspended solids, BOD, pH and phosphorus results. The second was to identify deficiencies in specific analytical methods, where possible, within the limits of the experimental design.

Ninety two laboratories participated in the study. Of these, 52 were provincial, municipal or regional government facilities. The provincial labs were, in most cases, sewage treatment plant laboratories. The remaining 40 participants were commercial, industrial or university facilities.

Technical Approach

The basic design of this study was determined at a meeting of representatives of the MOE, CAEAL, WTC, NWRI and NRC held at the MOE Rexdale offices on October 11, 1990. It was decided that for each parameter a series of 8 or 9 synthetic samples would be prepared. Each series was to contain a blank, where applicable, and two sets of duplicates, one at the low end and one at the high end of the concentration range. The remainder of the samples were to span the range of concentrations normally encountered in sewage samples. From this range of concentrations, an assessment of the precision and bias could be made.

The samples were sent to the participants in two phases. Phase I was comprised of samples for analysis of BOD and suspended solids. These were shipped on ice by courier on November 14, 1990. Results were requested by December 31. Phase 2 was comprised of samples for pH and phosphorus. They were shipped on January 14, 1991. Results were requested by January 31.

Several techniques were used to assess data in this study. These included a non-parametric technique to discern bias and the assignment of flags to results that deviate significantly from target values. The combination of the two; flagging data and discerning bias, provided a powerful technique for reviewing performance. Laboratory-specific appraisals were produced by a computer reading of Youden outputs.

The performance of individual laboratories was assessed by examining the bias and precision assessed by the Youden technique as well as graphs of the submitted results plotted against the interlaboratory mean values. From this assessment, individual laboratories were classed as "poor", "moderate" or "satisfactory". The moderate or satisfactory classifications would generally be considered acceptable laboratory performance.

As the sample sets for suspended solids, BOD and phosphorus each contained two pairs of duplicates, we also assessed laboratory performance with respect to the agreement of the duplicates. A pooled estimate of the variance of the difference between duplicate results was used in the assessment. Results falling more than two standard deviations from the mean difference were identified as questionable.

Findings

The overall response from the participating laboratories was about 90%. In both phases of the study there was a slightly higher response for the commercial labs than from the non commercial labs, but the differences were marginal.

For suspended solids, less than 10% of the labs were judged as biased and 82% of the labs fell into the moderate or satisfactory classes. A significant proportion of laboratories, however, submitted values above their method detection limits for the blank sample. This suggests that these participants have difficulty in reliably measuring solids in the low concentration range.

For BOD, 18% of the participants were judged as biased. Significantly more labs were biased low than were biased high. For all other parameters, there were approximately equal numbers of high and low biases. Seventy six percent of labs fell into the moderate or satisfactory classifications.

For pH, 9% of participants were judged as biased, while 91% fell into the moderate or satisfactory categories.

For phosphorus, 18% of labs were assessed as biased and only 63% fell into the moderate or satisfactory classes. This means that the performance of 37% would be considered poor. Over one half of the participants reported values above their method detection limits for the blank sample.

The performance of the commercial and the non commercial lab sectors were compared by examining their mean and median results, the frequency of bias and imprecision and the number of labs generally performing poorly in each group. The results indicated that there were significantly more poor performers with respect to BOD and phosphorus in the non commercial sector than in the commercial sector.

The precision acheived by the participants as a group was examined and compared to that reported by the USEPA for their performance evaluation studies. We found that a central core of good laboratories acheived a level of precision equal to that reported by the USEPA. This excellent performance reflects the benchmark of performance that should be maintained in future interlaboratory studies. It should be noted, however, that the central core of good laboratories represent only 20 to 30% of all participants.

Recommendations

Based on these findings, we recommend the following:

1) We recommend that the findings of this report be distributed to the participants to allow lab staff involved in making measurements, the opportunity to react to the findings and correct any problems that have been identified.

2) To rectify the apparent problems in the performance of BOD and phosphorus assays in the non commercial sectors, additional training for lab staff at these facilities may be warranted. This could be carried out as part of an MOE training program or could be subcontracted.

3) In view of the generally poor performance of a large percentage of laboratories in carrying out phosphorus determinations, additional intercomparison studies linked to training programs are recommended. These additional studies should address the problems of laboratory performance and possible deficiences of particular methods.

4) As these assessments were carried out using mainly synthetic samples, which should be simpler to analyse than real samples, we recommend that a followup study be carried out to assess performance on matrices which approximate those normally measured in the participating laboratories. This is of crucial importance in view of the serious implications that measurement errors would have on treatment plant operations and the determination of pollutant loadings to receiving waters.

2.0 INTRODUCTION

This interlaboratory study was commissioned by the Ontario Ministry of the Environment (MOE) to evaluate the capability of labs to measure the common sewer-use parameters; biochemical oxygen demand, suspended solids, pH, phosphorus and metals.

The overall administration of the study was carried out by the Canadian Association of Environmental Analytical Laboratories (CAEAL). The technical aspects of the study including sample preparation, sample distribution, and data evaluation for the first four parameters were carried out by the Wastewater Technology Centre (WTC) and the National Water Research Institute (NWRI). The metals portion of the study was carried out by the National Research Council (NRC). This report describes the interlaboratory study carried out by the WTC and NWRI under CAEAL contract number 90-504, to assess biochemical oxygen demand, suspended solids, pH and total phosphorus.

We approached this study with two objectives in mind. The first was to assess the relative performance of the labs with respect to the accuracy and precision of their suspended solids, BOD, pH and phosphorus results. The second was to identify deficiencies in specific analytical methods, where possible within the limits of the experimental design.

Ninety two laboratories participated in the study. Of these, 52 were provincial, municipal or regional government facilities. The provincial labs were, in most cases, sewage treatment plant laboratories. The remaining 40 participants were commercial, industrial or university facilities. A list of the participants is included in Appendix 1.

3.0 TECHNICAL APPROACH

3.1 STUDY DESIGN

The basic design of this study was determined at a meeting of representatives of the MOE, CAEAL, WTC, NWRI and NRC held at the MOE Rexdale offices on October 11, 1990. It was decided that for each parameter a series of 8 or 9 samples would be prepared. Each series was to contain a blank, where applicable, and two sets of duplicates, one at the low end and one at the high end of the concentration range. The remainder of the samples were to span the range of concentrations normally encountered in sewage samples. From this range of concentrations, an assessment of the precision and bias could be made.

Though natural samples were considered, it was recognized that synthetic materials would offer greater overall precision at the required target concentrations. The goal therefore became the design of a matrix that would possess the required stability and homogeneity, as well as having the appearance of a natural effluent. Such a solution should be relatively inert to biological, chemical or physical degradation at natural pH ranges, thereby remaining stable over the study period.

The specifics for each parameter are as follows:

Suspended Solids:

A total of 9 samples were to cover the range of 5-40 mg/L suspended solids, and be prepared from synthetic material. The series was to include 1 blank and 2 sets of duplicates, one at each end of the analytical range.

BOD: A total of 8 samples covering the range of 5-40 mg/L BOD were to be prepared from synthetic material. The series was to include 2 sets of duplicates, one at each end of the analytical range. A blank was not necessary.

pH: Samples covering the range of 5-9 pH units were to be prepared from standard material. It was recommended that preparations of high and low ionic strength be provided. Carbonate buffers were to be avoided.

Total Phosphorus:

A total of 8 samples covering the range of 0-2.5 mg/L total phosphorus, were to be prepared from standard material. The series will include 1 blank and 2 sets of duplicates, as above.

The list of participating laboratories was provided by the MOE and each was issued a unique code number by CAEAL. These code numbers were used in all subsequent correspondence to ensure the confidentiality of the results.

The samples were sent to the participants in two phases. Phase I was comprised of samples for analysis of BOD and suspended solids. These were shipped in ice by courier on November 14, 1990. Results were requested by December 31. Phase 2 was comprised of samples for pH and phosphorus. They were shipped on January 14, 1991. Results were requested by January 31.

After each deadline, a summary of the raw results were returned to the participants with a request that they check for data entry errors. The labs were advised at the outset that changes to results, other than data entry errors occurring in the computer entry process, could not be made at this time. Lab Number W0468 requested changes to their BOD, suspended solids and phosphorus results after discovering calculation errors at their end. Lab number W0429 requested changes to their result for sample PH6 after finding that the sample pH had changed with time.

3.2 PREPARATION OF REFERENCE MATERIALS

3.2.1 Preparation of BOD and Suspended Solids Standards

The study solutions were formulated from a naturally occuring organic resin combined with a naturally occuring inorganic material with particle size greater than 0.2 um. The suspended solids and BOD reference solutions were combined in one solution by incorporating appropriate masses of glutamic acid and glucose.

The calculated masses of the four components were weighed individually on a four place analytical balance. The organic/inorganic medium was then added to an appropriate volume of cold, nitrogen purged tap water being mixed by a vortex mixer at 1700 RPM. in a 300 litre polyethylene tank.

All weights and volumes were audited by at least one other person.

Following a 30 minute mixing period the glucose/glutamic acid component was added and was followed by a further 10 minute mixing. A spigot at the bottom of the tank was opened to a constant flow position and sampling was commenced.

Samples were taken in pre-rinsed 500mL polyethylene containers. The bottles were numbered sequentially and were filled in order. This was done to allow us to track which bottles were sent to which laboratory. It was the intent to monitor the measured results against bottle number to determine whether there was any systematic variation in solids concentration from the top of the tank to the bottom.

The bottles were placed in a cold room at 4.0°C at the completion of the sampling run. The runs were completed over a two day period. Following one week of cold storage the solutions were packed in coolers with freezer packs and shipped to the participants. In every case delivery was made within 24 hours of shipping.

3.2.2 Preparation of pH Standards

A set of eight pH standards were prepared for the interlaboratory study. Of these, five were synthetic and three were prepared from sewage plant effluent or natural creek water.

The synthetic standards were prepared in new 50 litre polyethylene carboys according to methods described in reference 1. All reagents were supplied by Fisher Chemical and water treated by reverse osmosis was used for dilution. The standards were prepared according to the following procedure:

1) One weighed portion of water (22.53 Kg) was added to a carboy.

2) Reagents were added followed by a second weighed portion of water (22.53 Kg). The dry reagents were further rinsed into the carboy using a measured amount of water to bring the total volume to 50 litres.

3) The mixtures were stirred until all reagents were dissolved.

4) The solutions were stored without preservation at 4°C until bottling.

5) The solutions were transfered into new 250 mL polyethylene containers and were kept at 4°C until shipping (about one week).

The quantities of reagents used to prepare the synthetic standards are summarized in Table 1.

TABLE 1: Reagents Used to Prepare Synthetic PH Standards

Sample Number	Target pH	Volume of Water (litres)	Volume of 1 N NaOH (litres)	Potassium Hydrogen Phthalate (g)	Potassium Dihydrogen Phosphate (g)	Boric Acid (g)
PH2	5.0	48.80	1.19	510.58	-	-
PH8	6.4	49.37	0.63	-	340.23	-
PH1	7.4	48.02	1.98	-	340.23	-
PH3	8.4	48.57	0.43	-	-	154.58
PH5	9.0	48.93	1.07	-	-	154.58

The natural samples used as pH standards in this study were based on STP effluent collected in October 1990 from the Skyway Waste Water Control Plant in Burlington, Ontario, and water collected in the summer of 1990 from Spencer Creek.

The sewage plant effuent was centrifuged shortly after collection and autoclaved at 90°C for at least 15 minutes. The material was then stored at 4°C. A portion of this effluent was later diluted by 33% with reverse osmosis water. For use in this study, these materials were

directly bottled in 250 mL polyethylene containers. Neither of these preparations contained any preservative.

The Spencer Creek water was collected by NWRI and was stored unpreserved at 4°C until use.

The pH of the natural samples was determined at the time of collection and immediately prior to use in this study. These results are presented in Section 4.2.3 of this report.

3.2.3 The Preparation of Total Phosphorus Standards

A set of eight phosphorus standards were prepared for the interlaboratory study. All were synthetic and, as discussed in section 3.1, the series incorporated two pairs of duplicates and one blank.

The standards were prepared in 50 litre polypropylene carboys, pretreated with three Milli-Q water rinses, a soak in 0.3% sulphuric acid and three more Milli-Q water rinses. The solutions were prepared according to the following general protocol:

1) A weighed amount of water (about 20 Kg) was added to a carboy.

2) Concentrated sulphuric acid was added to bring the final concentration to 0.3%.

3) The required amount of a 1000 mg-P/L stock solution (SPEX Industries Inc) was pipetted into 250 mL water in a 500 mL beaker. This solution was then transfered to the carboy and the weight taken.

4) After each addition, the weight or volume was checked by a second analyst and the record initialled.

5) The contents were stirred for one minute with an electric mixer.

6) The solutions were stored at room temperature until bottling.

7) The solutions were bottled in 125 mL glass containers which had been prewashed in chromic/sulphuric acid and rinsed with Milli-Q water.

The quantities of reagents used to prepare the standards are summarized in Table 2.

TABLE 2: Reagents Used for the Preparation of Phosphorus Standards

Sample Number	Target Conc. (mg/L)	Phosphorus Stock* (mL)	Water (Kg)	Sulphuric Acid (mL)
TP1	2.199	40.0	18.071	75
TP2	1.027	20.0	19.353	75
TP3	1.563	30.0	19.062	75
TP4	1.538	30.0	19.372	75
TP5	blank	0	19.040	75
TP6	0.539	10.0	18.437	75
TP7	0.154	3.00	19.315	75
TP8	0.156	3.00	19.089	75

*: 1000 mg/L Total Phosphorus concentrate

3.3 DATA EVALUATION

The assessment of data in this project was approached by several techniques. The first and perhaps most important was the non-parametric technique to discern bias. Bias is considered critical since it is a systematic error normally attributed to an incorrect calibration. It is a correctable error.

The second approach was the assignment of flags to results that deviated significantly from target values. The combination of the two; flagging data and discerning bias, provide a technique for reviewing performance. These procedures are described below. Additional information is can be found in the literature (references 2,3,4,5,6,7).

The discussion below relates to the data files found in Appendix 3. The reader is advised to review these Youden output files in the context of the narrative below. Additional details are available in a manual dealing with external QA assessment (reference 3).

3.3.1 Ranking to Discern Bias

The Youden bias assessment technique is a non-parametric process in which a matrix of results (for example; 10 samples and 50 laboratories) is converted into a matrix of ranks. Each sample (with say 50 results) is ranked such that the lowest result is assigned a rank of 1, the second lowest has a rank 2 and so on. The highest results has a rank of 50 if there are 50 laboratories. When laboratories report "equal values" then an average rank is assigned. Examples are provided by Youden in references 4 and 5.

The next step in the ranking process is to review the total laboratory rank (sum of ranks) or the average rank. The immediate impact is the recognition that some laboratories have an overall rank which is very high or very low. The question to resolve is whether these anomalously high or low ranks are rare events (less than 5% chance of occurring) or could occur naturally by chance.

To evaluate if bias exists, one needs to use a traditional hypothesis test. First, it is assumed that no bias exists. The next step is to calculate the probability of each total rank from the matrix of ranks (eg. 10 by 50). This calculation (found in gambling handbooks) is synonomous with calculating the probability of scores when 10 dice (samples) are thrown and each dice has 50 sides (50 labs). The probabilities of interest are the very high and very low scores. When extreme scores are found in the matrix of ranks with occurence probabilities of less than 5%, then the null hypothesis is rejected and the lab data set is declared biased. The risk of declaring a lab biased, when it is not, is one chance in 20.

Non-parametric tests are powerful procedures for discerning small systematic errors in calibrations. In some cases, the decision is valid but is so slight that some laboratories are unable to adjust their calibration to remove the slight differences between their standards and the error implied from the interlaboratory study evaluation. The bias of some labs is

sometimes so severe (10 to 30% error) that bias assessment by Youden's ranking method need not be applied since a graphical format or simple visual review of the matrix results is adequate (refer to Youden output in Appendix 3).

The Youden bias assessment in many large studies can successfully address and discern the presence of innaccuracy in the laboratory measurement process. The rigour with which this method identifies inaccuracies is clouded when serious blank issues occur or if the entire group of labs is in error. Rarely is the entire group of labs in error, but vigilance must be maintained when difficult substrates and constituents are under review (eg. toxic organics in fish or sediments).

In other situations, where results are very erratic, the statistical inference is "no bias" simply because some results are extremely high and others extremely low. A severe lab problem nevertheless exists. To address this, a flagging formula was adopted to address poor intralaboratory precision.

3.3.2 Flagging Results

To complement bias assessment, large or small studies can use a flagging procedure that identifies a lab result as very high or very low. The flagging process and the bias assessment are two different and separate evaluation procedures. Flagging is critical since some laboratories are imprecise. In these cases, the degree of bias cannot easily be determined since there may be both very high and very low results which average out. Some examples of laboratory performance are given in Figure 1.

Formulas for flagging individual results of samples within a study have been developed for many traditional constituents. Experience has shown that within any study covering a concentration range of 1 or 2 orders of magnitude, the interlaboratory standard deviation varies and increases almost linearly from low concentration to high concentration. For a visual presentation of this, refer to the precision functions illustrated in Figures 6,7,8 and 9.

The relationship between interlaboratory precision and concentration allows for the construction of a simple formula for flagging. Three variables are required to decide if a results reported deviates sufficiently from an interlab median to warrant a flag (high or low).

The first is the basic acceptable error (BAE). This is the allowable deviation fixed over all concentrations. The second is the lower limit for use of the basic acceptable error (LLBAE). This lower limit is the concentration at which the acceptable deviation (result reported minus the median) begins to increase. The rate of increase, similar to the slope of the precision function, is referred to as the concentration error increment (CEI). These three variables (CEI, LLBAE and BAE) are given in the Youden files found in Appendix 3.

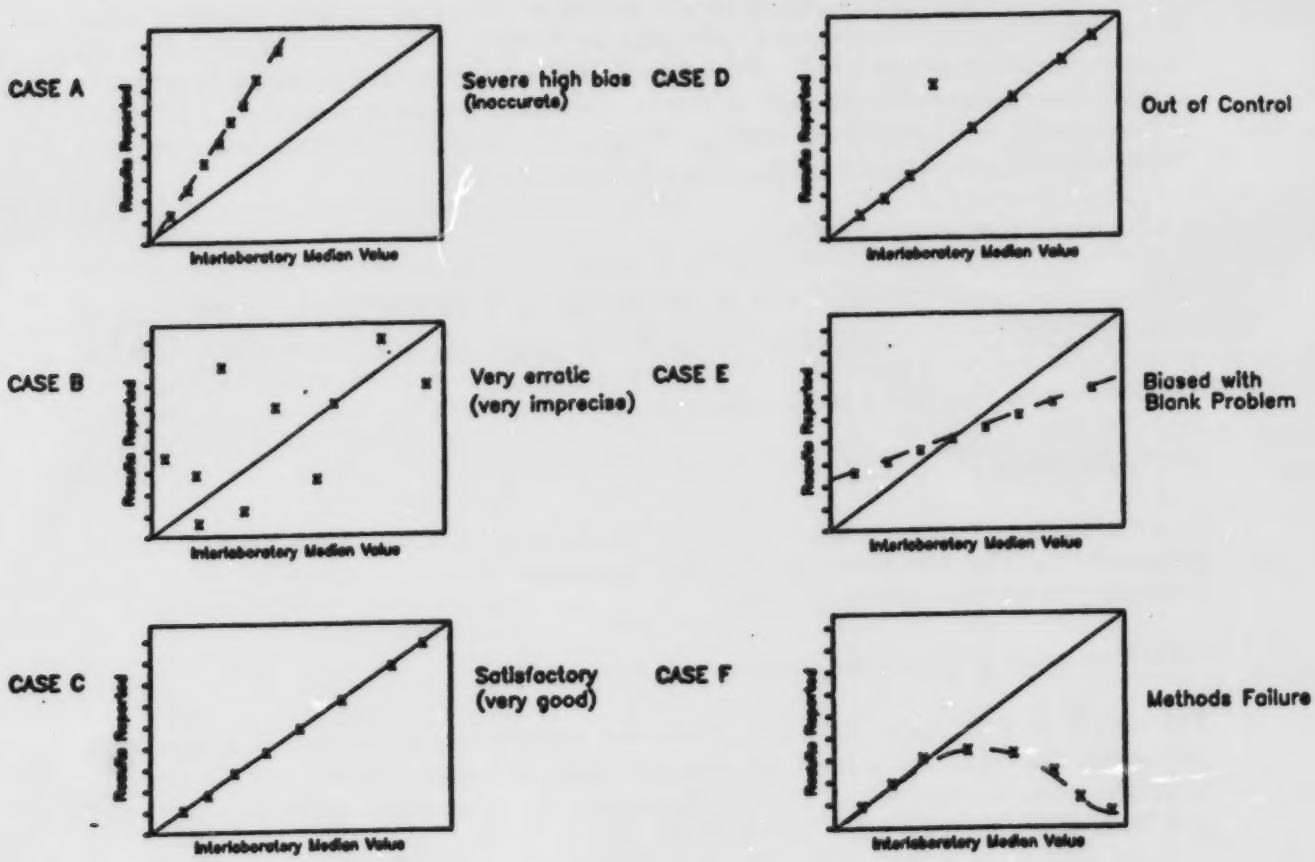

Fig. 1 Some typical types of Laboratory Performance revealed by External QA Studies

The relationship between the observed precision function and the flagging formula is quite clear. The principle issues to be resolved are the values assigned to the BAE, LLBAE and CEI. Some trial and error may be required if the information on the correct precision function is unknown. The median is chosen as a target since medians are more robust than the average values. The average, or mean, values are often influenced by extreme results. The chosen flagging criteria can be adjusted so that about 10 to 30% of all results are flagged either high (H) or low (L). When results are very different, they can be flagged very high (VH) or very low (VL). These results are those that deviate by more than 1-1/2 times the acceptable deviation. Extremely high (EH) or extremely low (EL) flags are assigned if the deviation is more than two times the acceptable deviation.

3.3.3 Performance within a Study

The performance of labs within a study can be assessed by comparing labs on frequency of flags (expressed as a percentage) and on the frequency of biased parameters. For this project with two two-parameter studies, it was decided to merge all data and summarize performance as if it were a single study with four parameters.

3.3.4 Appraisals

Laboratory-specific appraisals are produced by a computer reading of the Youden outputs (Appendix 3). The appraisals are snapshot statements of the success or failure of each laboratory in the measurement process.

3.3.5 Evaluation of Lab Performance on Duplicate pairs

The sample sets for suspended solids, BOD and phosphorus each contained two pairs of duplicates. A pooled estimate of the variance of the differences between duplicates was calculated using the formula; $S^2 = \Sigma d^2/2g$, where d = difference between duplicates and g = number of duplicate pairs (reference 8).

Once the pooled estimate was calculated, it was refined after rejecting those values falling outside 3 standard deviations. The difference between each pair of results was then compared against the refined pooled estimate. Differences falling outside 2 standard deviations of the mean difference were flagged as outliers.

4.0 RESULTS AND DISCUSSION

4.1 SUMMARY OF LAB PARTICIPATION

Table 3 summarizes the number of respondents to the MOE/CAEAL Interlaboratory study. The respondents have been separated into groups according to whether they fall into the commercial sector (private, industry of university labs) or the non commercial sector (municipal, regional or sewage treatment plant labs). The deadline for submission of results was December 21, 1990 for Phase 1 and January 31, 1991 for Phase 2.

TABLE 3: Summary of Laboratory Participation

Lab Sector	Parameters	No. Participating	No. Responding	% Response
Commercial	BOD/Solids	37	35	95
	pH/Phosphorus	40	37	93
Non Commercial	BOD/Solids	39	36	92
	pH/Phosphorus	47	40	85
All groups	BOD/Solids	76	71	93
	pH/Phosphorus	87	77	89

In both phases of the study, there was a slightly higher response from the commercial labs (95 and 93% for the first and second phases of the study) than from the non commercial labs (92% and 85 % for the first and second phases respectively). Response in this case was taken to mean that the results for at least one parameter of the two shipped in each phase of the study were reported.

The majority of the analyses were carried out in-house by each laboratory, however several treatment plant laboratories reported that their normal procedure was to send samples to a central lab for analysis. Edwardsburg, Merrickville, Petawawa and Deloro WPCPs reported routinely sending phosphorus samples to the MOE Regional lab in Kingston. Trenton,

Frankfurt and Battawa WPCPs report sending their BOD samples to the MOE WPCP lab in Belleville. The Frankfurt and Battawa plants send their suspended solids samples to Trenton for analysis. The Corunna WPCP routinely sends samples to the MOE Regional lab in London for BOD and solids tests.

4.2 VERIFICATION OF REFERENCE MATERIAL CONTENT

4.2.1 Suspended Solids

The major concerns in the formulation of the test solutions were homogeneity and stability.

To establish homogeneity, a pilot bulk preparation of 250 litres having a design value of 28 mg/L was sampled over the entire tank volume. This was carried out in an effort to reveal discrepancies in analyte concentration related to mixing. Two 1 litre samples were also taken after 1/3 and 2/3 of the bulk mixture had been dispensed. Each of these samples were then analysed six times in order to establish the within bottle variation.

For the samples collected as the tank was drained, the following results were found:

X = 27.5 mg/L
SD = 1.4 mg/L
CV = 5.1 %

The within bottle results (6 repeat analyses from the same bottle) provided the following:

X = 28.5 mg/L
SD = 1.3 mg/L
CV = 4.6 %

These results show that the mean and standard deviation of the results from the top to the bottom of the tank were not significantly different than those taken from one bottle. This indicated that the samples were homogenous.

During the actual bottling run, the preparations were also sampled a minimum of eight times to verify the design values and sample homogeneity. The coefficients of variation ranged from 2.5 % to 6.5 % within the individual batches.

The homogeneity of the suspended solids samples was also confirmed by the returning participant lab results as shown in Figure 2. In this plot of suspended solids concentration vs. bottling sequence (bottle number), there is a random distribution about the overall mean value. This is a direct indication of good homogeneity within the bulk preparations.

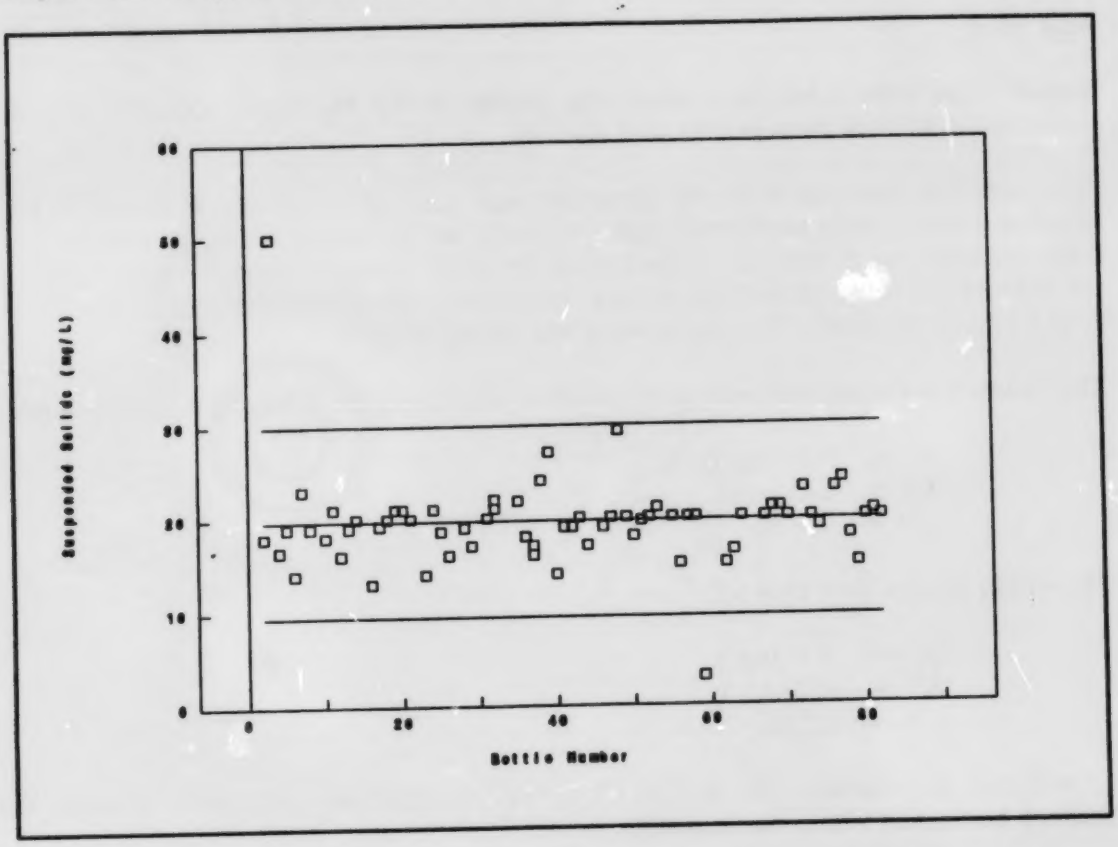

FIGURE 2: Comparison of Measured Suspended Solids for Sample SS1 Against Bottle Number

The values obtained by the participating laboratories for solids sample SS1 are plotted against bottling sequence in this figure. Bottle number 1 was filled first while bottle 80 was filled last. The central horizontal line represents the overall mean value. The upper and lower lines represent the mean ± 2 standard deviations.

To establish stability over time, 24 samples were taken at regular intervals over period of three weeks from a stock having a design value of 14 mg/L. The results are as follows:

DAY 1: X = 14.0 mg/L	DAY 12: X = 14.7 mg/L	DAY 20: X = 14.3 mg/L
SD = 1.2 mg/L	SD = 1.3 mg/L	SD = 1.0 mg/L
CV = 8.7 %	CV = 8.8 %	CV = 7.0 %

These results show that there was no detectable decrease in the target value or change in the variability of the measurements over the anticipated duration of the study. Monitoring of individual samples taken from the actual preparations have shown good stability over a period of three months.

4.2.2 BOD

Similar steps were taken to confirm the quality of the BOD test solutions provided confirmation of both homogeneity and stability.

A homogeneity check of BOD was run at the same time and in parallel to the initial pilot suspended solids study mentioned above. As with the suspended solids, 17 samples were taken from the top of the tank to the bottom for BOD. Large samples were also taken at the 1/3 and 2/3 levels of the bulk mixture and were analysed six times each to provide the within sample variation. The target value was 20 mg/L BOD.

The between bottle samples were analysed in duplicate and the following results obtained:

X = 19.5 mg/L
SD = 0.41 mg/L
CV = 2.1 %

The within sample data showed :

X = 19.3 mg/L
SD = 0.52 mg/L
CV = 2.7 %

As with the suspended solids results, there was no significant difference between the between bottle and within bottle results.

A plot of the BOD results from the participating labs against bottle number is shown in Figure 3. Once again random distribution about the overall mean clearly denotes good homogeneity of the bulk mixture.

Samples taken during the actual runs and analysed over a period of time in all cases showed coefficients of variation of less than 3.5 %. Samples taken in parallel to those sent out in the study and archived over a period of three months have shown remarkable stability with deviations from the target values of less than 10 %.

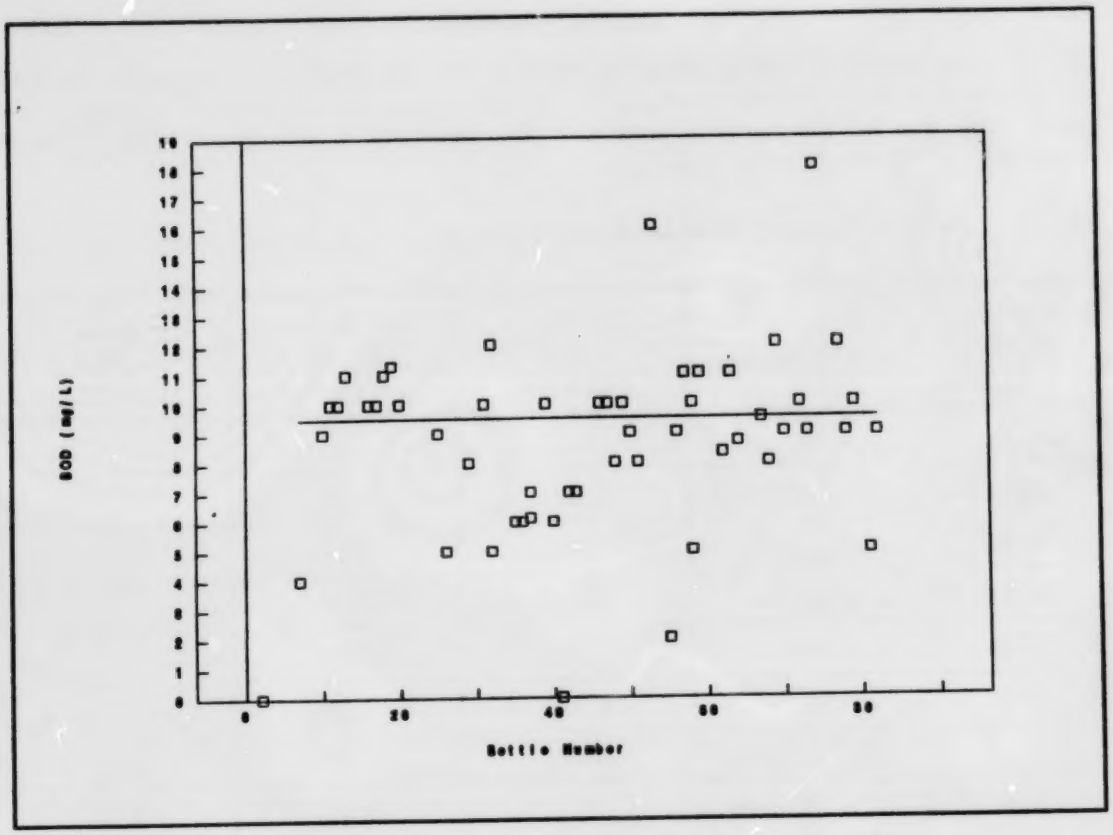

FIGURE 3: Comparison of Measured BOD for Sample BOD1 with Bottle Number

The values obtained by the participating laboratories for sample BOD1 are plotted against the order of bottling in this figure. The low bottle numbers were filled first. The horizontal line represents the mean adjusted to remove extreme outlying values.

4.2.3 PH

The pH of the standards and samples employed in this study were verified by measurements carried out in at least two laboratories. The values obtained are tabulated in Table 4. The results show that for the synthetic standards, the measured values agreed with the target values within 1% or better in each case.

TABLE 4: Verification of pH Standards

Sample Number	Target pH (pH units)	NWRI* Result (pH units)	WTC* Result (pH units)	NWQL* Result (pH units)
PH2	5.0	5.011	5.05	
PH8	6.4	6.381	6.39	
PH1	7.4	7.365	7.42	
PH3	8.4	8.372	8.30	
PH5	9.0	8.915	8.83	
PH6	STP Effluent	9.547	9.46	9.47
PH4	STP Effluent (diluted by 1/3)		8.16	8.16
PH7	Creek water		8.09	

*: NWRI; National Water Research Institute
WTC; Wastewater Technology Centre, Inorganic Lab Group
NWQL; National Water Quality Laboratory

4.2.4 Phosphorus

The phosphorus content of the synthetic standards used in this study were verified by measurements carried out in two laboratories prior to shipment. These results, summarized in Table 5, show that the measured values agreed with the target values within at least 3% in each case. The repeat measurements (mean and standard deviation shown) performed by the NWQL indicate that the preparations were homogenous at the time of shipping.

TABLE 5: Verification of Total Phosphorus Standards

Sample Number	Target Conc. (mg-P/L)	NWQL* Result (mg-P/L) (n=5)	WTC* Result (mg-P/L) (n=2)
TP1	2.199	2.264±0.008	2.1
TP2	1.027	1.021±0.019	1.1
TP3	1.563	1.530±0.019	1.6
TP4	1.538	1.516±0.012	1.6
TP5	blank	<0.004	<0.1
TP6	0.539	0.5310±0.0015	0.6
TP7	0.154	0.1504±0.0013	0.2
TP8	0.156	0.1513±0.0009	0.17

*: WTC; Wastewater Technology Centre, Inorganic Lab Group
NWQL; National Water Quality Laboratory

4.3 SUMMARY OF RESULTS FROM PARTICIPATING LABORATORIES

The analytical results of this study are summarized in Table 6. In this table, the target or design values are given in addition to the mean, median and standard deviation of the pooled analytical results for all labs. The individual lab data are included in Appendix 2.

Suspended Solids:

The results in Table 6 show that the median suspended solids result falls within 10% of the target value in each case. As expected, the mean value is skewed by a few outlying results but generally agrees well with the design value.

The close similarity of the median values to the design indicates that the samples were stable during the course of the study. This period was about one month. Our results show that aqueous preparations of this type should be stable for up to three months.

It is of concern that 14 of 71 laboratories reported a non zero value for sample SS5, which contained only Milli-Q water. In some cases, results of several ppm were reported. As a results, while we do not anticipate labs having difficulty in accurately determining suspended solids at levels of 100-200 mg/L that are generally encountered in compliance with sewer use bylaws, some laboratories may encounter problems at concentrations in the 10-15 mg/L range.

BOD:

As with the solids results, the median BOD value fell within 10% of the target while the means were skewed by outlying results. The closeness of the medians to the expected result again indicates that the samples were stable through the course of the study. Our results indicate that the samples are stable for about three months when refrigerated.

TABLE 6: Overall Summary of Results

Sample Number	Parameter	Target Value*	Units	Overall Mean	Overall Median	Standard Deviation	False Positives**
SS1	S.Solids	22	mg/L	19.70	20.00	5.01	
SS2	S.Solids	12	mg/L	11.82	11.00	5.54	
SS3	S.Solids	29	mg/L	29.69	30.00	5.14	
SS4	S.Solids	22	mg/L	20.44	20.00	5.29	
SS5	S.Solids	0	mg/L	0.98	0.00	2.66	14/71
SB1	S.Solids	45	mg/L	45.33	46.00	5.41	
SB2	S.Solids	38	mg/L	39.87	39.00	7.56	
SB3	S.Solids	55	mg/L	58.99	59.00	8.50	
SB4	S.Solids	45	mg/L	45.98	46.00	5.82	
BOD1	Total BOD	9	mg/L	13.70	10.00	32.04	
BOD2	Total BOD	5	mg/L	5.99	5.32	5.05	
BOD3	Total BOD	17	mg/L	20.95	18.00	25.93	
BOD4	Total BOD	9	mg/L	12.81	10.00	26.77	
SB1	Total BOD	32	mg/L	31.58	31.00	7.91	
SB2	Total BOD	24	mg/L	26.97	25.00	9.25	
SB3	Total BOD	35	mg/L	35.21	34.00	10.77	
SB4	Total BOD	32	mg/L	24.26	31.40	11.85	
TP1	Phosphorus	2.20	mg/L	1.81	2.00	0.57	
TP2	Phosphorus	1.03	mg/L	0.95	1.00	0.30	
TP3	Phosphorus	1.56	mg/L	1.37	1.50	0.39	
TP4	Phosphorus	1.54	mg/L	1.35	1.48	0.40	
TP5	Phosphorus	0	mg/L	0.17	0.03	0.70	41/73
TP6	Phosphorus	0.539	mg/L	0.49	0.52	0.21	
TP7	Phosphorus	0.154	mg/L	0.18	0.16	0.13	
TP8	Phosphorus	0.156	mg/L	0.23	0.16	0.57	

TABLE 6 (Continued):

Sample Number	Parameter	Target Value*	Units	Overall Mean	Overall Median	Standard Deviation	False Positives**
PH1	pH	7.4	pH units	7.43	7.45	0.12	
PH2	pH	5.0	pH units	5.08	5.05	0.12	
PH3	pH	8.4	pH units	8.27	8.30	0.24	
PH4	pH	8.16 #	pH units	7.72	7.70	0.28	
PH5	pH	9.0	pH units	8.87	8.91	0.22	
PH6	pH	9.46 ##	pH units	9.19	9.20	0.36	
PH7	pH	8.1 ###	pH units	8.01	8.06	0.26	
PH8	pH	6.4	pH units	6.43	6.43	0.11	

*: Based on WTC lab results for BOD and Solids,
Calculated from reagents added for pH and Phosphorus
**: Value above MDL reported for blank
#: Skyway STP effluent, diluted by 1/3
##: Skyway STP effluent, undiluted
###: Spencer Creek water

pH:

The mean and median results of the pH analyses were in all cases extremely close to the target values, shown in Table 6. We note, however, that the values obtained for the pH 8.4 and 9.0 samples were lower than the design value by 1-2%. This may be due to a reduction in pH arising from carbon dioxide absorption by these alkaline samples. Alternatively, it may reflect a calibration problem.

The coefficient of variation for these samples ranged from 1.6-3.0% for the synthetic standards to 3.2-3.6% for the sewage and creek water samples. The higher variability in measurements of the natural samples may reflect some sample instability or a problem measuring real samples. Some participants (W0429 and W0526) reported that the pH of sample number PH6 drifted to a lower value with time.

To ascertain whether the sample pH did change with time, the measured sample results were plotted against the elapsed time between the shipping date and the reported date of analysis. Figure 4 shows such a plot for the sewage sample PH6. The following figure (Figure 5) shows the ratio of values obtained for the STP effluent (sample number PH6) and that of the standard having a pH of 9.0 (sample number PH5) plotted against elapsed time. Both plots show a very slight reduction in pH as the samples aged. One of our own laboratories did notice a drift in the pH on exposure to air during the measurement but two others did not. It is also odd that the diluted sewage has a much reduced pH compared to

the undiluted material. This may indicate that some complex chemical change occured in the sample as the result of the dilution. Because of these uncertainties, we cannot conclude that the greater variability noted with the natural samples is solely the result of lab problems.

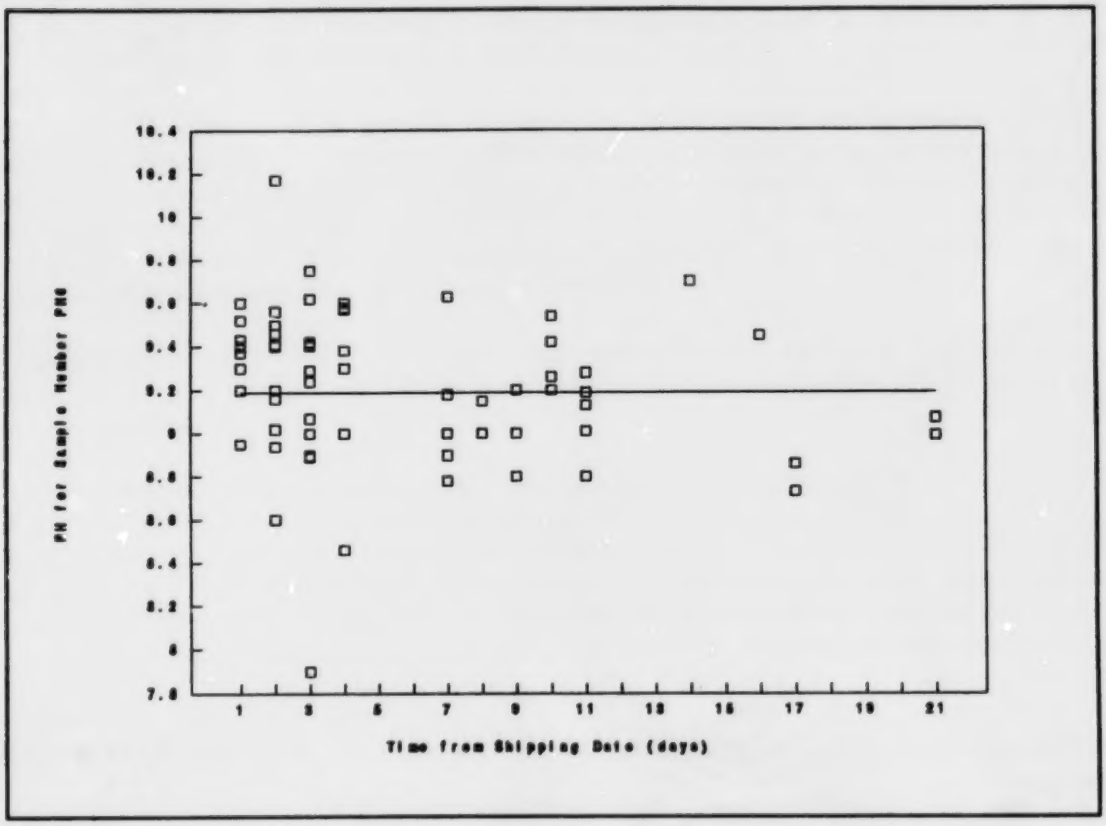

FIGURE 4: Measured Results for Sample PH6 as a Function of Time Between Shipping Date and Analysis Date

The results obtained for the STP effluent sample PH6 are plotted against the time elapsed between the shipping date and the reported analysis date in this figure. The horizontal line represents the overall mean result.

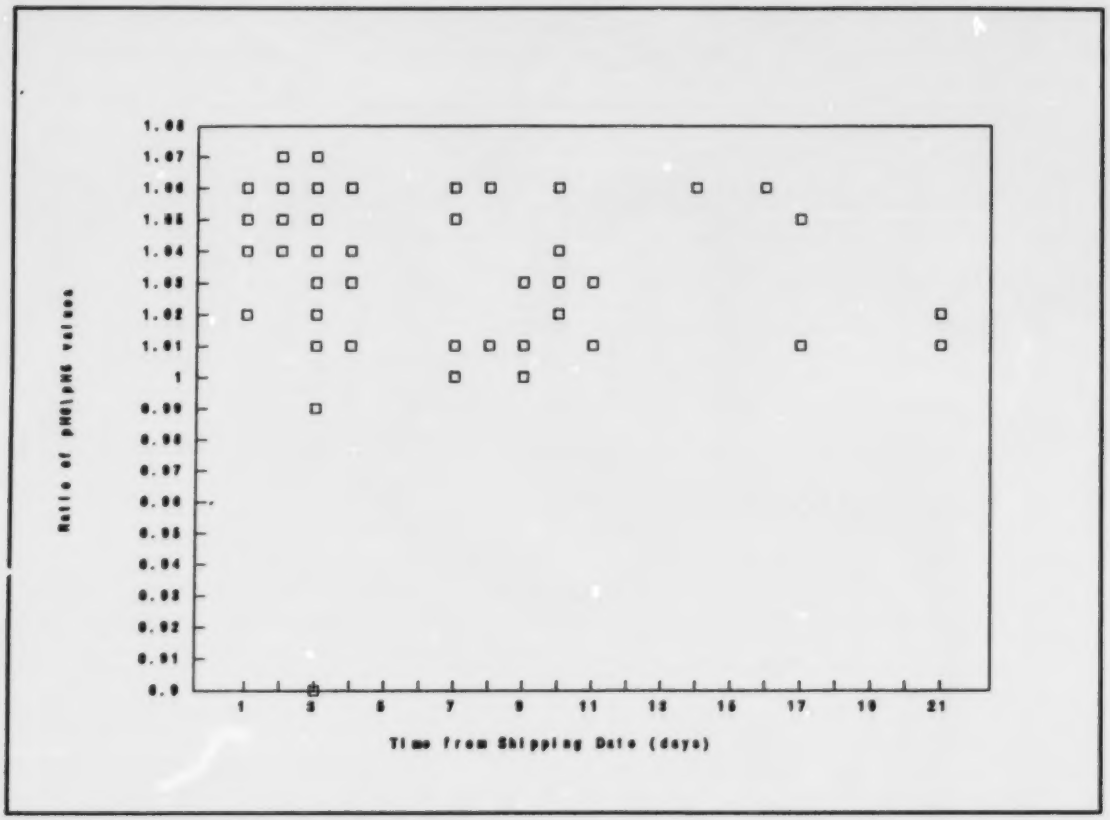

FIGURE 5: Ratio of Values Obtained for Sample PH6 and PH5 versus Time Elapsed Before Analysis

The ratio of results obtained for the STP sample (number pH6) and the synthetic standard having a pH of 9.0 (sample number PH5) is plotted against the time elapsed between the shipping date and the reported analysis date.

Total Phosphorus:

As the results of skewing by outlying results, the mean results lie up to 35% from the target. In all but one case, the medians fall within 5% of the expected value. The exception is the 2.2 mg/L standard, where the median lies 10% from the target. Analysis of this sample by the NWQ Laboratory confirmed the calculated value of 2.2 while the WTC labs found 2.1. This suggests that the fault does not lie with the sample itself but may indicate a general failure of the phosphorus methods at concentrations of 2 ppm.

We note that one lab reported that they had analysed the samples for another lab and found that the two supposedly identical samples gave different results. We were not, however, able to establish where the source of the variation lay. During preparation of the samples, every 40th sample in each batch was measured. As shown in Table 5, the measurements showed a coefficient of variation of less than 1 %, indicating that the samples were, to the best of our knowledge, homogenous at the time of shipping.

A second lab noted low recoveries with their method when analyzing acid preserved samples, such as in this study. We have no knowledge of how many other laboratories had a similar problem.

About one half of the participating labs reported non-zero values for the blank, which was prepared from Milli-Q water preserved with 0.3% sulphuric acid and verified by the NWQL. Of these, 32% (13/41) reported values greater than 0.1 ppm. The mean value for the blank over all labs was 0.17 ± 0.70 mg/L. Thus, a large percentage of labs would report values greater than 0.5ppm on a sample containing no phosphorus. Many labs had difficulty accurately measuring phosphorus at concentrations near the proposed compliance limit of 0.5ppm.

4.4 ASSESSMENT OF LABORATORY PERFORMANCE

The results from the NWRI database assessment process are compiled in Appendices 2 to 6 of this report. This compilation includes a complete data summary with minimal statistics (Appendix 2), the Youden assessment of bias and flags (Appendix 3), a comparison of performance (Appendix 4), laboratory specific appraisals (Appendix 5), and a graphical illustration of how the reported results compare to the interlab medians (Appendix 6).

4.4.1 Discerning Bias

Bias in the context of this report is viewed as a systematic error normally attributed to incorrect calibration. It is discerned from the whole data set provided using the techniques described in section 3.3.1 of this report and the enclosed references. It is therefore accepted as a relative bias, but may be viewed as an inaccuracy if the group of labs with central tendency are intercalibrated to an absolute standard, such as NBS material.

The occurence of bias is documented in Appendix 3 and summarized in Appendix 4. Laboratories are encouraged to review the bias issue with reference to the graphics for their lab (see Appendix 6). If the bias is serious, laboratories are encouraged to review this matter with the "users of the data".

An examination of the bias assessment for each parameter, summarized below, shows that between 10 and 20% of the labs were assessed as biased using the Youden technique.

SUMMARY OF BIAS ASSESSMENT

Parameter	Biased High	Biased Low	% of Labs Biased
Susp. Solids	3/71	3/71	8%
BOD	2/57	8/57	18%
pH	4/77	3/77	9%
Phosphorus	6/75	7/75	17%

4.4.2 Assigning Flags

The criteria used to assign flags to results that deviate from target values were described in section 3.3.2 of this report and the included references. To develop these criteria, knowledge of how the precision varies as a function of concentration is required. The precision data in Appendix 2 may be plotted as a function of the mean values, but these data are badly tainted by outliers. To improve the relationship, the authors have arbitrarily chosen to remove 10% of the lowest and 10% of the highest results and recalculated the precision for each sample. The flagging criteria used in this study were based on the precision achieved

by the core of laboratories representing the remaining 80%.

The relationship between precision and concentration for three of the parameters (Suspended solids, BOD and phosphorus) was linear. No clear relationship existed for pH and it was decided to accept a basic error of 0.25 and employ no increment. More data is required for pH in order to establish a clean relationhip between precision and concentration.

The flagging criteria for each parameter are found in the header lines of the tables in Appendix 3. The criteria as set were able to isolate about 1/5 to 1/3 of the data as deviating from interlab medians. Individual flagged results are given are given in Appendix 3 and are summarized in Appendix 4. The reader should note that the flagging process is an advisory that can quickly isolate erratic or very imprecise laboratories.

4.4.3 Laboratory-Specific Appraisals

A summary of laboratory performance is given in Appendix 4. There are four tables; one for each parameter, and a fifth that merges all parameters. This last table summarizes the relative performance of laboratories.

In comparing performance it is understood that excellence is achieved when no flags or no bias have occurred. Poor performance is indicated if many flags and many biased parameters occur. Laboratory managers are encouraged to react constructively if they incur many flags and biases. For some laboratories, an internal review is in order. It should be noted that the concept of poor is academic and is an issue requiring consultation between analyst and the users of the data.

An appraisal has also been prepared that is specific to each laboratory. These are compiled in Appendix 5. They are capsule summaries created by a computer reading of the Youden outputs (Appendix 3) and incorporating the criteria listed on the first page of Appendix 5.

4.4.3.1 Graphical Illustration of Results

Appendix 6 graphically compares the results reported with the interlaboratory median. Each laboratory is encouraged to review their own graphics in addition to their appraisal in Appendix 5. These graphics quickly illustrate "bias", "erratic data", the concept of "out of control", "methods failure" (severe curvature), and of course satisfactory performance. Figure 1 in Section 3.3.2 of this report illustrates each of these cases.

4.4.3.2 Evaluation of Individual Laboratory Performance

In order to categorize performance, the authors have merged the graphical evidence and the information from the appraisals given in Appendix 5. Three observers examined each

laboratory file and applied criteria which allowed each laboratory to be categorized for each parameter group as "poor", "moderate" or "satisfactory" with respect to performance. The conditions used to identify a laboratory as "poor", "moderate" or "satisfactory" are given below. The overall assessment is tabulated in Table 7.

Criteria for the Rating of Laboratory Performance

Poor Performance:

Any of the following:

* the method fails (extreme curvature in graphics)
* results are erratic (two extremely high and two extremely low results)
* severe bias (as discerned by the Youden technique and visibly evident from the graphs)
* bias assessed by the Youden method and four or more results flagged
* three results flagged, of which, two or more are extreme results
* results are slightly erratic with three or more of the results flagged.

Moderate or average performance

Any of the following:

* slight bias as discerned by Youden but no results flagged
* bias is discerned but only two or three results are assigned a high or low flag
* results are slightly erratic with only one extreme high and one extreme low result
* slight methods failure, no flags, but failure of method evident from the graphics
* many results flagged, four or fewer high or low flags but none assigned as extreme

Satisfactory performance

* no bias exists and no flags were assigned on any of the results
* all results are without flags with the exception of one result indicated with an extreme flag (termed out of control)
* only one very high or one very low flag was assigned
* three or less high or low flags assigned (no results are extreme or very high or low)

TABLE 7: An Overview of Laboratory Performance (Page 1 of 2)

Parameter	Performance Class	Laboratory Code*								No. of Labs**
Suspended Solids	Poor	023	179	247	335	337	377	404	427	13(18%)
		447	456	462	524	538				
	Moderate	009	028	198	255	430	439	493	498	10(14%)
		526	535							
	Satisfactory	042	072	127	147	148	149	211	238	48(68%)
		239	243	248	266	305	364	370	380	
		390	417	418	428	429	431	433	441	
		448	460	463	464	468	471	476	477	
		480	482	485	489	497	506	511	514	
		516	528	529	533	542	551	522	999	
BOD	Poor	042	147	148	149	239	255	335	404	14(24%)
		429	456	471	489	528	529			
	Moderate	072	243	418	427	439	468	485	514	9(16%)
		535								
	Satisfactory	211	238	248	337	364	417	428	430	34(60%)
		431	433	441	447	460	462	463	464	
		476	477	480	482	493	497	498	506	
		511	516	524	526	533	538	542	551	
		552	999							

* Note that the WO prefix has been deleted from the lab codes for the purposes of this table

** Represents the number of labs falling into each category for each parameter. The percentage of labs in each class for each parameter is given in brackets.

TABLE 7: An Overview of Laboratory Performance (Page 2 of 2)

Parameter	Performance Class	Laboratory Code								No. of Labs
pH	Poor	017	233	441	471	498	533	538		7(9%)
	Moderate	147	198	239	248	335	380	404	428	
		468	506	515	524					12(16%)
	Satisfactory	009	010	021	023	028	042	072	127	
		148	149	179	190	211	238	247	255	
		266	305	336	337	364	370	377	382	
		389	417	418	427	429	431	433	439	
		447	448	456	460	462	463	464	469	
		476	477	480	482	489	493	497	511	
		514	516	526	528	529	535	542	551	58(75%)
		552	999							
Phosphorus	Poor	17	127	179	198	247	248	335	336	
		370	377	380	382	389	404	439	464	
		468	469	471	482	489	497	498	511	
		514	524	528	552					28(37%)
	Moderate	364	417	428	433					4(5%)
	Satisfactory	9	23	28	42	72	147	148	538	
		211	233	238	239	243	255	266	149	
		337	418	427	429	431	441	447	305	
		456	460	462	463	476	477	480	448	
		506	515	516	526	529	533	535	493	
		542	551	999						43(57%)

The evaluation shown in Table 7 is a peer group assessment in which the bias is determined with the data sets created by the peer group and where the flagging formulae were established from the precision function defined from a subgroup of the more competent laboratories.

The results in Table 7 are disturbing because of the large number of laboratories displaying poor performance. For phosphorus, 37% of the labs were classed as poor. The impact of these apparent deficiencies is potentially serious. Poor quality lab data would influence the operation of Wastewater Treatment Plants, jeopardize the assessment of total phosphorus loadings to receiving waters, and complicate compliance with regulatory limits. In view of the serious nature of these potential impacts, the authors recommend that a followup study be undertaken to confirm both that the method and laboratory related issues have been addressed.

4.4.4 Comparison of Commercial and Non Commercial Laboratories

To address the question of whether the two sectors were similar or different with respect to performance required splitting the database into two groups and processing parallel outputs. Two approaches were taken.

The first approach to comparing the two lab sectors was to assess the frequency of flags assigned by the Youden output and the frequency of biases. These results, shown in Table 8, illustrate that the flagging frequency is not the same for the two groups. This difference is not clear cut, however, since the flagging formula does not distinguish between slight and gross deviations.

The second approach to separating differences between the two groups of laboratories was that used above in section 4.4.3.2. Separating the commercial and non commercial laboratories in Table 7 produced the results in Table 9.

Table 9 illustrates that a large percentage of laboratories fall into the "poor" category. There appear to be significant differences between the commercial and non commercial sectors with respect to the number of laboratories assessed as "poor" for BOD and total phosphorus.

TABLE 8: Comparison of Frequency of Flags and Bias Between Commercial and Non Commercial Labs

	Parameter	Laboratory Sector	
		Non Commercial (%)	Commercial (%)
Median Percentage of Results Flagged	Susp Solids	22	25
	BOD	12.5	12.5
	pH	25	12.5
	Phosphorus	25	20
Percentage of Labs Biased	Susp Solids	9 (3/34)	8 (3/38)
	BOD	24 (5/21)	14 (5/36)
	pH	12.5 (5/40)	5 (2/37)
	Phosphorus	12.8 (5/39)	22 (8/37)
Note: Values in brackets are the ratios of biased labs to the total number of labs in the study			

TABLE 9: Comparison of the Performance of Commercial and Non-Commercial Labs

Parameter	Performance Class	Number of Laboratories (%)	
		Non-Commercial	Commercial
Suspended Solids	Poor	7(20%)	6(16%)
	Moderate	5(15%)	5(14%)
	Satisfactory	22(65%)	26(70%)
BOD	Poor	9(43%)	5(14%)
	Moderate	2(10%)	7(19%)
	Satisfactory	10(48%)	24(67%)
pH	Poor	4(10%)	3(8%)
	Moderate	7(18%)	5(14%)
	Satisfactory	29(73%)	29(78%)
Phosphorus	Poor	16(43%)	12(32%)
	Moderate	2(5%)	2(5%)
	Satisfactory	20(53%)	23(62%)

4.4.5 Lab Performance with Duplicate Pairs

The overall mean result and the pooled standard deviation of the differences between duplicates for each of the six duplicate pairs are summarized in Table 10.

The between duplicate standard deviations were calculated as described in Section 3.3.5. The overall standard deviations were derived from the data shown in Appendix 2, refined to remove outliers as described in Section 3.3.5.

TABLE 10: Summary of between-duplicate standard deviations

Sample	Mean ± Between Duplicate Standard Deviation	Mean ± Overall Standard Deviation	% of Total Variability Occuring Within Lab
BOD Pair #1	9.19 ± 1.75	9.19 ± 3.03	58
BOD Pair #2	32.30 ± 2.10	32.30 ± 8.08	26
Solids Pair #1	19.45 ± 1.93	19.45 ± 2.92	66
Solids Pair #2	45.77 ± 1.79	45.77 ± 5.49	33
Phosphorus Pair #1	0.169 ± .023	0.169 ± 0.101	23
Phosphorus Pair #2	1.36 ± 0.09	1.36 ± 0.39	23

The results provide an estimate of the within lab variability for these parameters. Comparison of the coefficient of variation for the duplicates with those calculated for the overall data (described in Section 4.3) demonstrates that, as expected, the within lab precision is less than the between lab precision. The within lab variability is not trivial, however. For example, the within lab variability for BOD accounts for about 26% of the total variability from all sources at the high end of the concentration range used in this study and 58% at the low end. For Suspended solids, the within lab variability accounts for 33% at the high end and 66% at the low end. For phosphorus, the within lab precision accounts for about 23% at both the high and low ends. It is clear from these results that the within lab precision cannot be dismissed as a factor contributing to the variability between laboratories in this study.

As described in Section 3.3.5, the differences between the results obtained with the duplicate pairs were compared against the pooled variances shown above. Differences greater than two standard deviations apart were flagged as suspect. Twenty four % of the labs produced flagged results for one pair of BOD duplicates. Nine % were flagged for both pairs. Thirty

two % of labs were flagged for one suspended solids pair, while nine % were flagged for both pairs. In the phosphorus series, thirty four % of labs were flagged in at least one of the duplicate pairs. Only one lab (1.4%) was flagged for both phosphorus pairs. Three % of labs were flagged for all four pairs in the BOD and solids series but no labs were flagged for all six pairs.

Plots of the results obtained with the duplicate pairs are given as Figures 6, 7 and 8. Figures 7 and 8, showing the results for BOD and phosphorus, display a cigar shaped distribution, indicative of systematic error in the measurements of some labs. The suspended solids results, shown in Figure 6, show a much more random distribution, suggesting minimal systematic error.

These paired sample plots, referred to as Youden pair plots, support the non parametric bias assessments which were detailed in Appendix 3 and summarized in Section 4.4.1. The non parametric technique showed that the BOD and phosphorus results were more frequently biased than the suspended solids results.

For comparison purposes, we have plotted the results obtained for pH samples PH3 (target value; 8.4) and sample PH5 (target value; 9.0) in Figure 9, although these are not true duplicates. This figure shows a cigar shaped distribution suggestive of systematic error in the results of some labs.

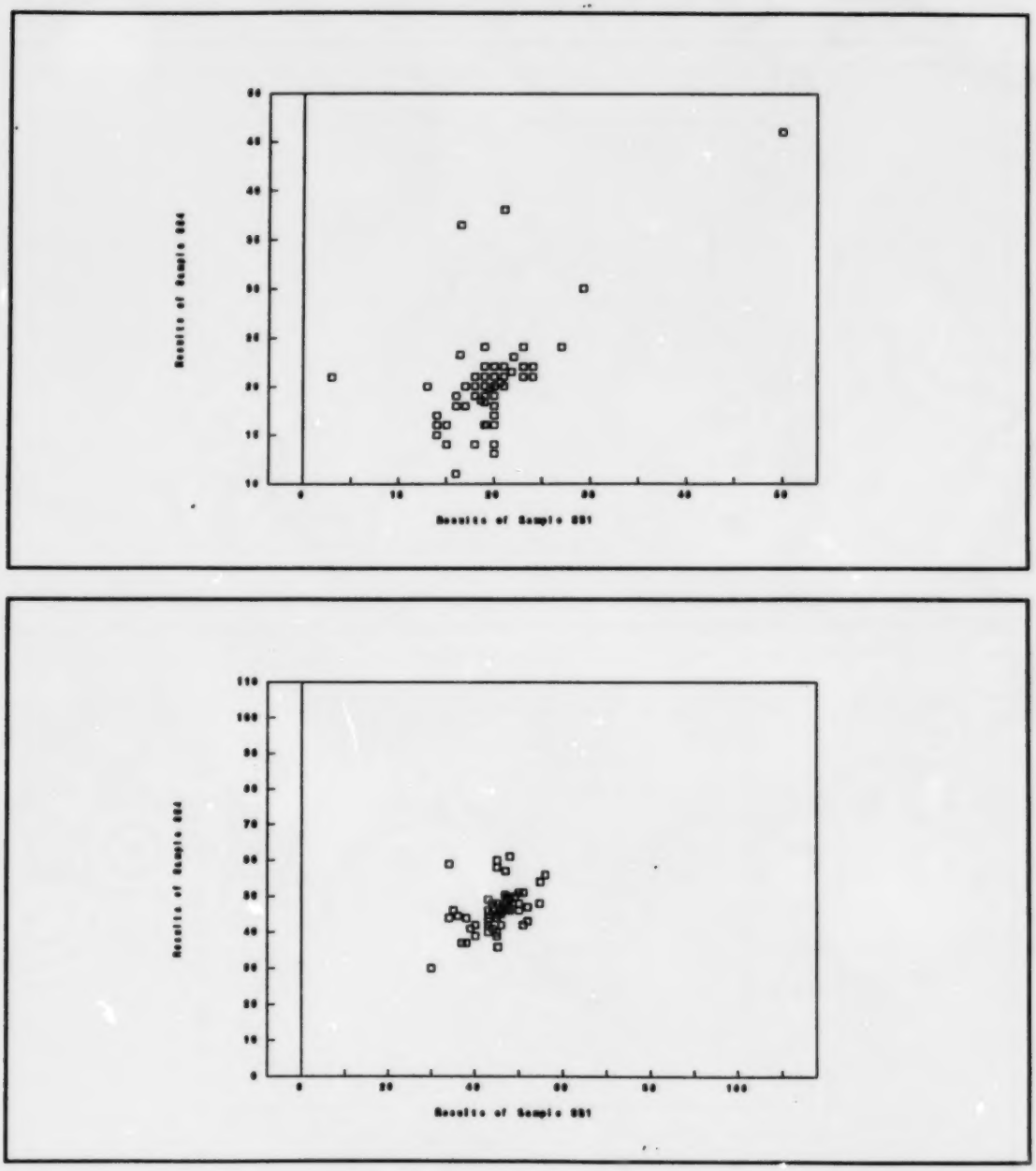

FIGURE 6: Comparison of Results of Duplicate Pairs for Suspended Solids

Upper Panel: Target concentration was 20 mg/L
Lower Panel: Target concentration was 46 mg/L

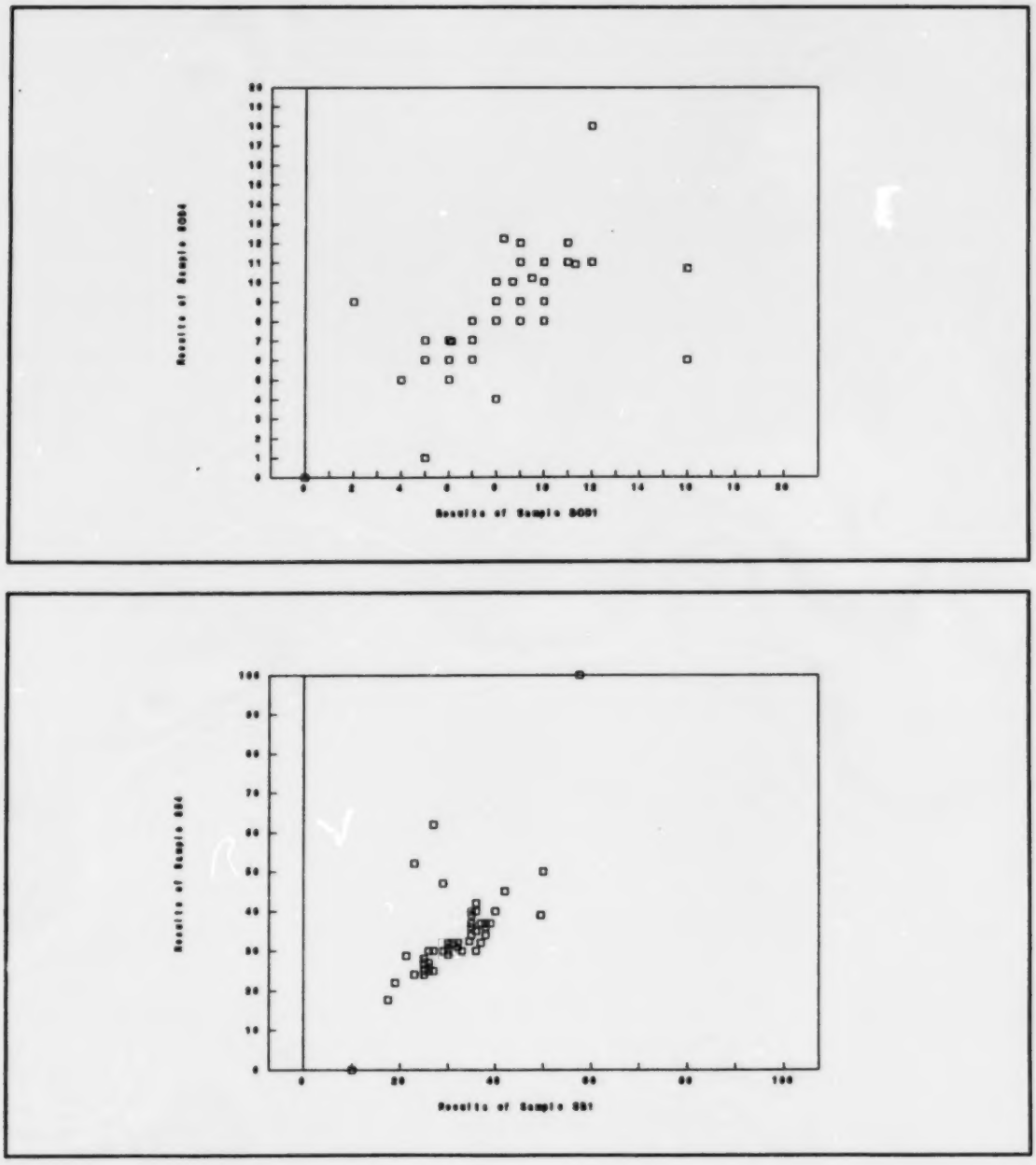

FIGURE 7: Comparison of Results of Duplicate Pairs of BOD Samples

Upper Panel: 9 mg/L target
Lower Panel: 32 mg/L target

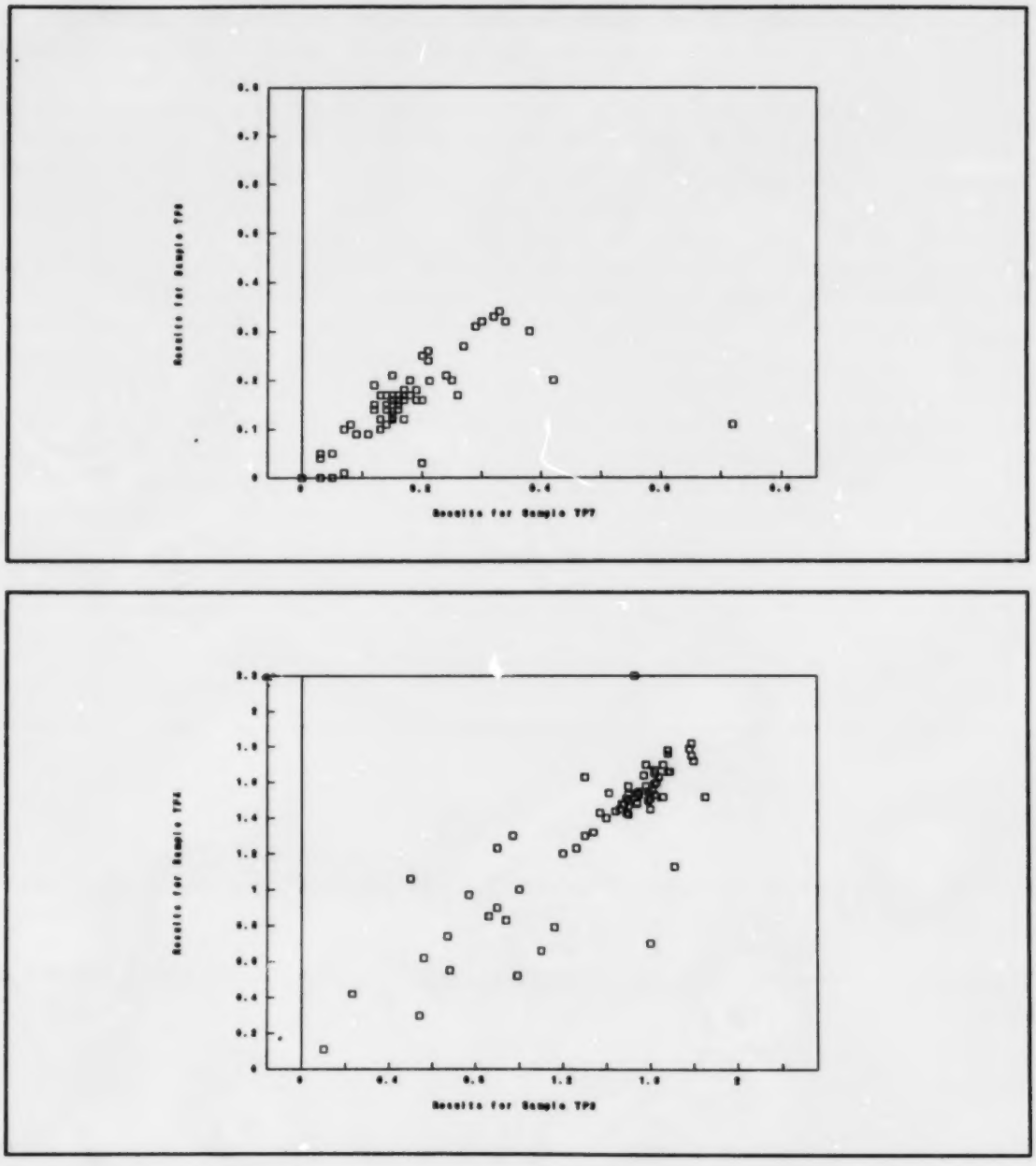

FIGURE 8: Comparison of Results of Duplicate Pairs of Phosphorus Samples

Upper Panel: 0.15 mg/L target
Lower Panel: 1.55 mg/L target

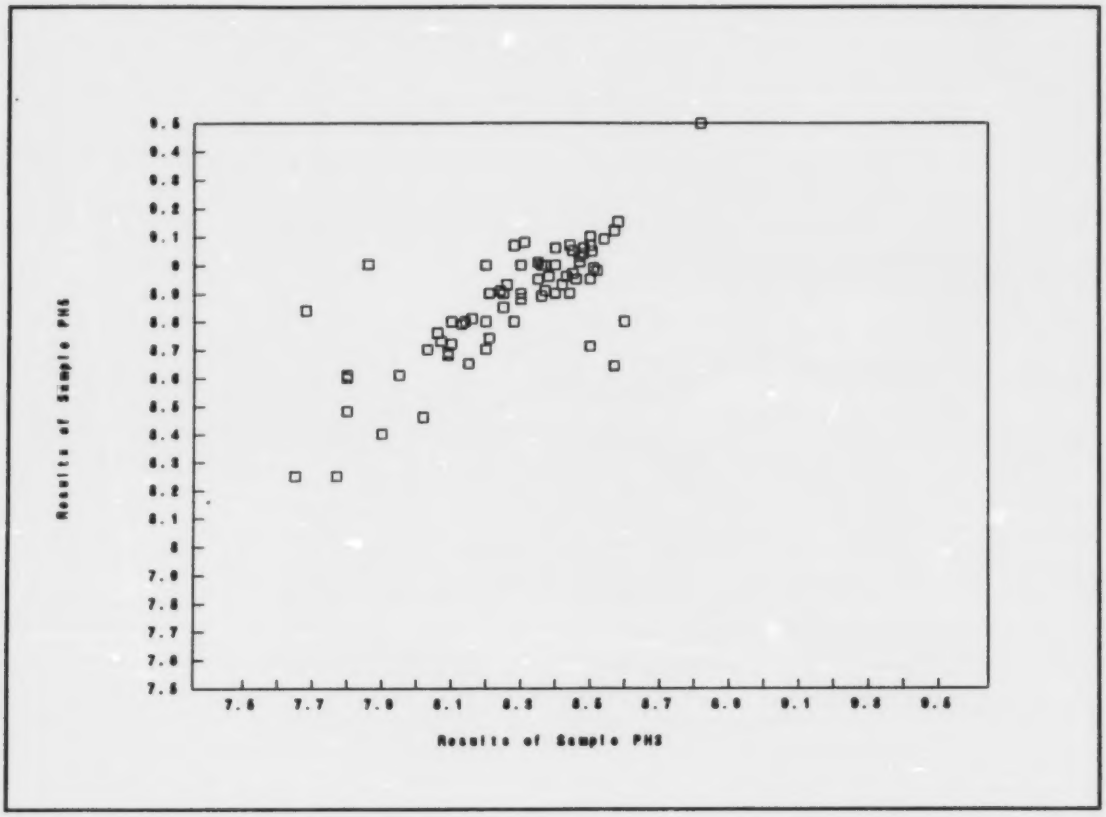

FIGURE 9: Comparison of Results Obtained With Two Standard Samples Having Similar pH Values

The target value for sample PH3 was 8.4 pH units, while the target for sample PH5 was 9.0 pH units

4.5 PRECISION ACHIEVABLE BY PARTICIPATING LABORATORIES

The precision functions for the results of this study are shown in Figures 10, 11, 12 and 13. In each of these figures, three sets of data are presented.

The upper line in Figures 10, 11, 12 and 13 describes the precision estimate using all the data reported. This data includes results that would be normally be defined as outliers by techniques such as Grubbs or of Dixon. The presence of these deviants overestimate what the authors would view as acceptable interlaboratory precision.

The estimate of precision is improved when the raw data is reduced by removing about 10% of the highest values and 10% of the lowest values . This relationship is given as the middle line in Figures 10 to 13. This line was used by the authors to develop the flagging criteria for the Youden assessment in Appendix 3.

The bottom lines in Figures 10 to 13 are the precision estimates derived by using only the data from those laboratories that had no bias and no flags assigned on any of the results in Appendix 3. This precision is viewed as excellent and attributed to those laboratories that are very satisfactory. The reader should note that this performance, which should become the benchmark for excellence in future interlaboratory comparisons, is apparent in only 20 to 30 percent of the laboratories.

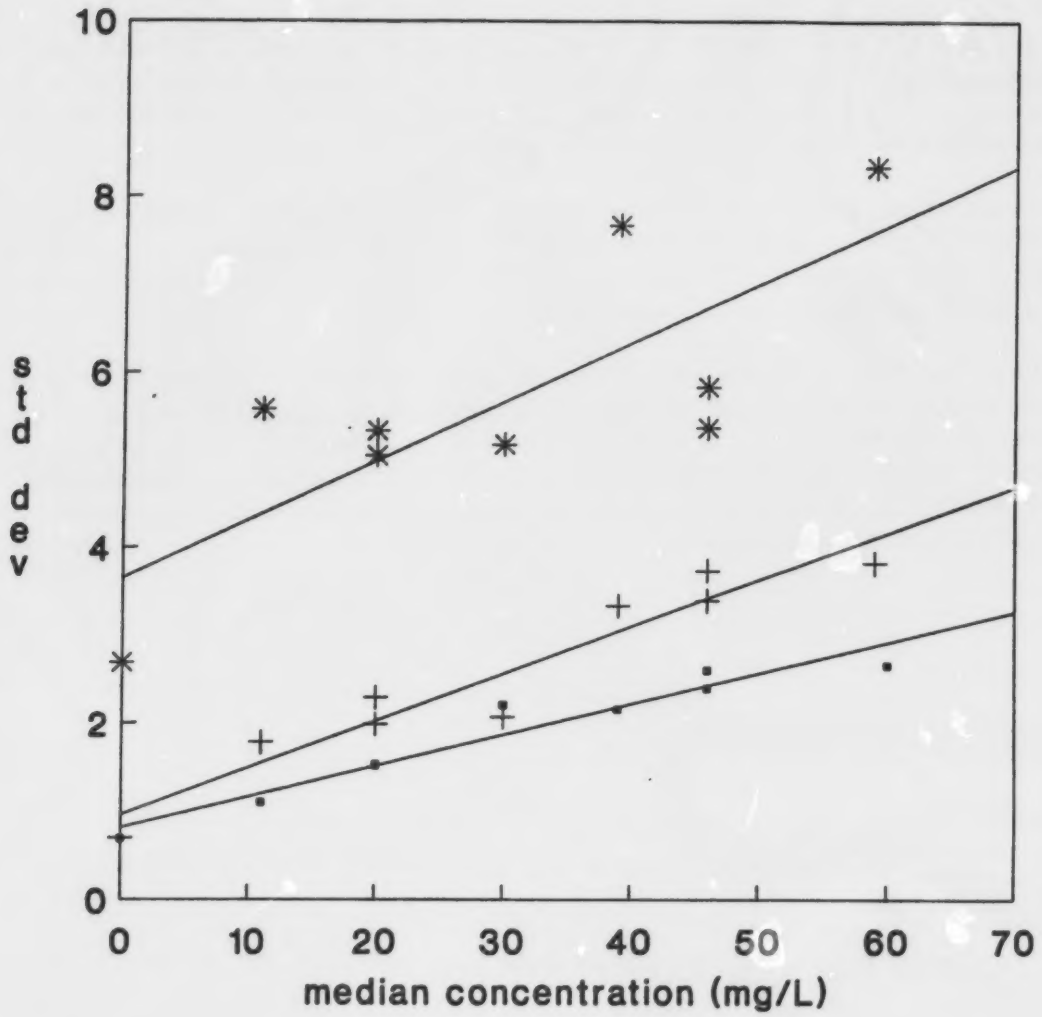

FIGURE 10: The Precision Function for Suspended Solids

The uppermost data points (*) describe the precision estimate using all data reported. The middle data set (+) was created when 10% of the highest and 10% of the lowest values were removed. The lower data set (▪) represent the precision estimates from those laboratories having no bias and no assigned flags.

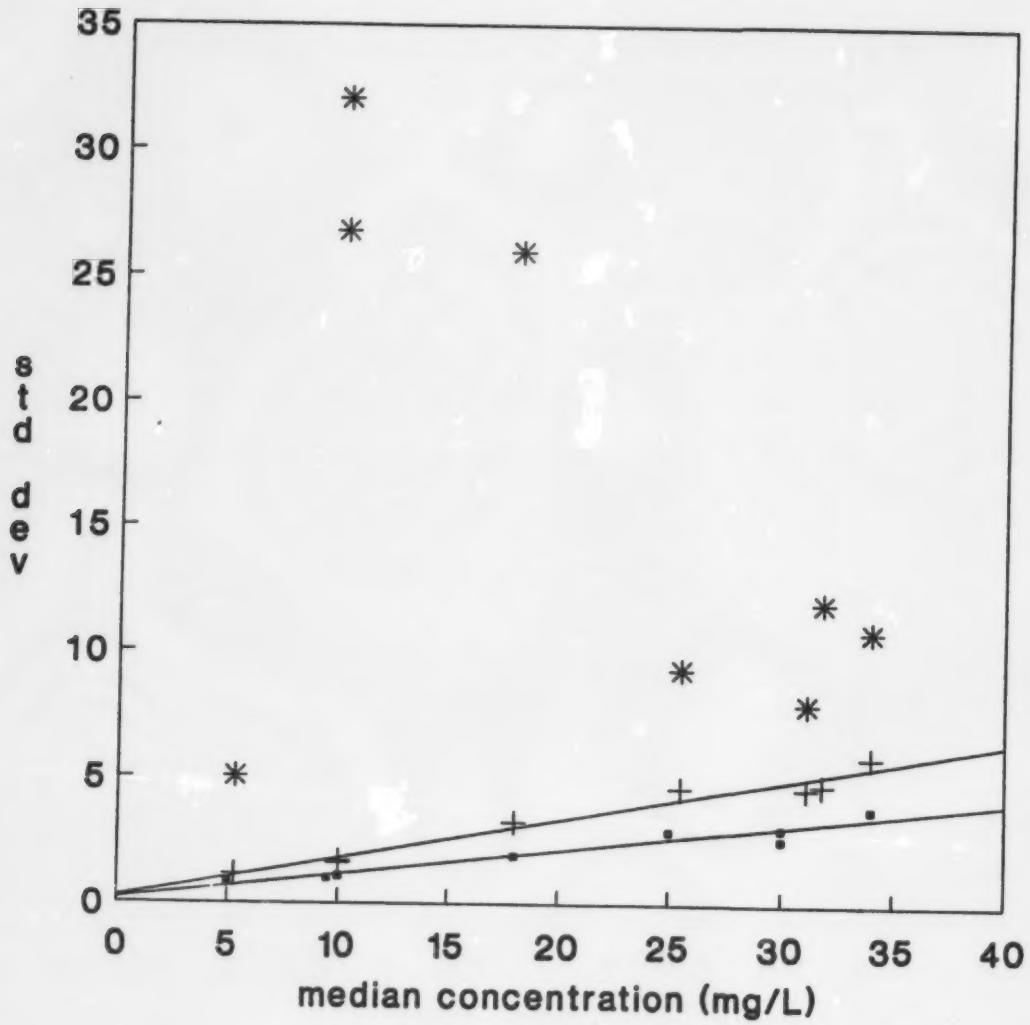

FIGURE 11: The Precision Function for BOD

The uppermost data points (*) describe the precision estimate using all data reported. The middle data set (+) was created when 10% of the highest and 10% of the lowest values were removed. The lower data set (▪) represent the precision estimates from those laboratories having no bias and no assigned flags.

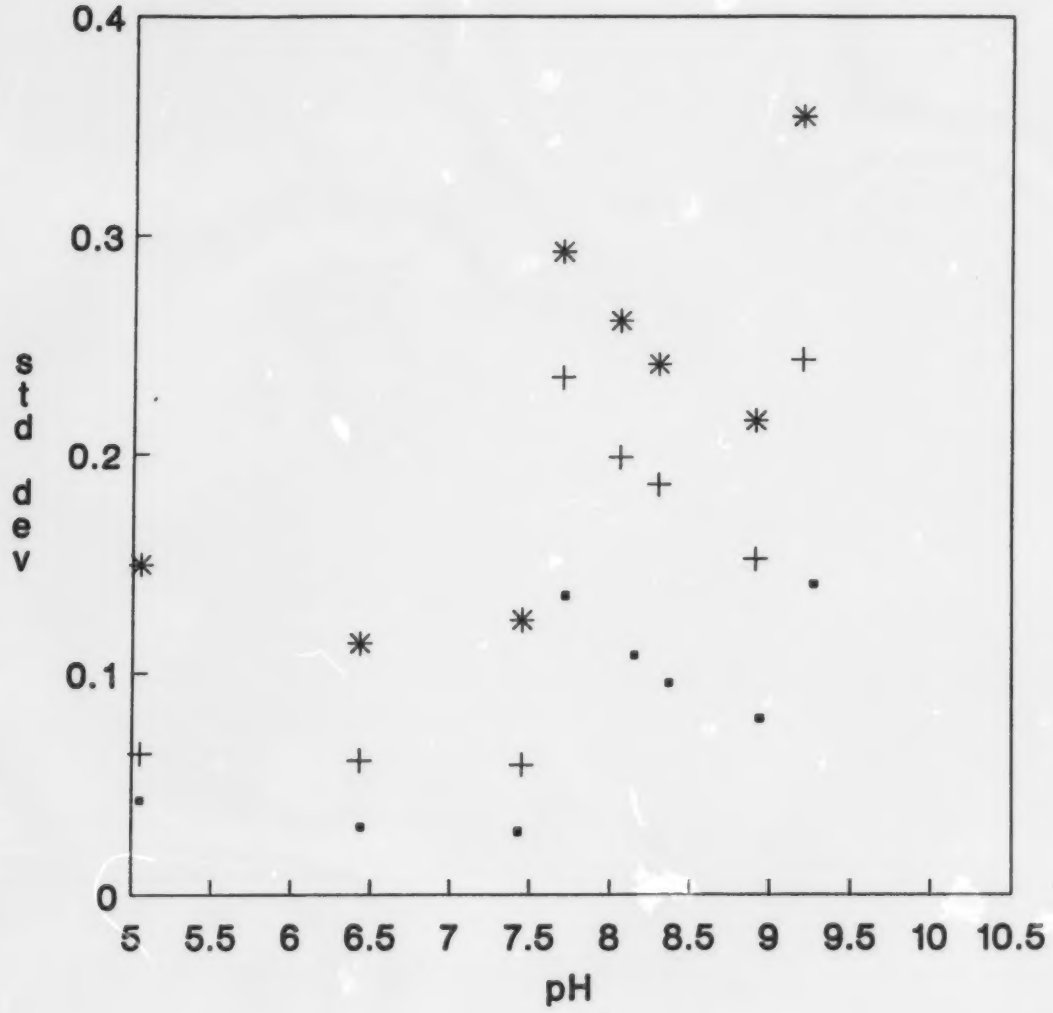

FIGURE 12: The Precision Function for pH

The uppermost data points (*) describe the precision estimate using all data reported. The middle data set (+) was created when 10% of the highest and 10% of the lowest values were removed. The lower data set (▪) represent the precision estimates from those laboratories having no bias and no assigned flags.

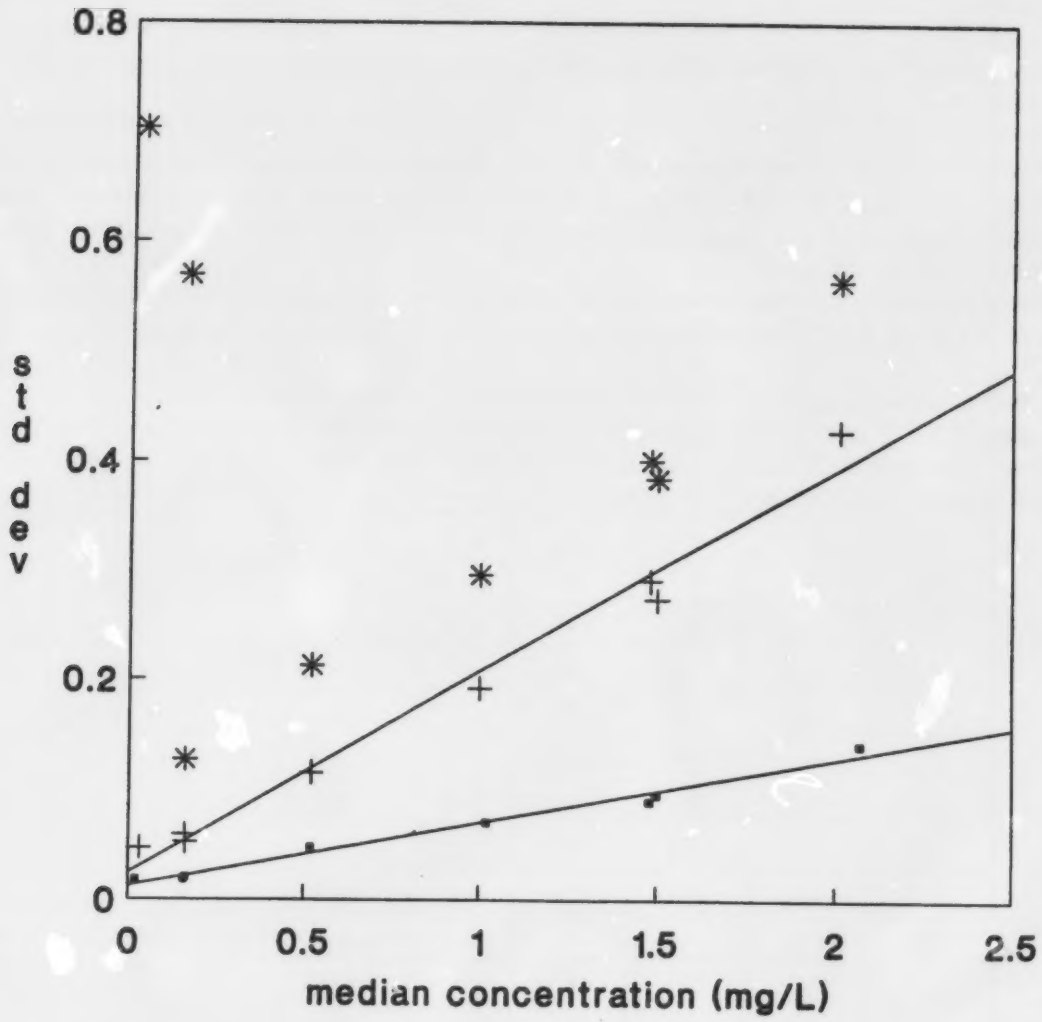

FIGURE 13: The Precision Function for Phosphorus

The uppermost data points (*) describe the precision estimate using all data reported. The middle data set (+) was created when 10% of the highest and 10% of the lowest values were removed. The lower data set (▪) represent the precision estimates from those laboratories having no bias and no assigned flags.

For comparison purposes, we have also calculated the anticipated precision (standard deviation) for each target concentration using the precision functions developed by the USEPA in their interlaboratory studies (reference 9). No data were available for suspended solids.

These calculated standard deviations are tabulated along with those obtained from the present study in Table 11.

This table illustrates that the overall standard deviations from the present study are much greater than those of the USEPA. This is largely due to the influence of a few outlying values. Removal of the upper and lower 10% of the data reduces the standard deviation dramatically to approach those of the USEPA in the case of BOD and pH, but not in the case of phosphorus. This occurred because the data still included results of laboratories that were biased or flagged as imprecise.

Removal of all flagged and biased data yielded a central core of satisfactory labs. It is evident from Table 11, that the precision acheived by this group equals that of the USEPA for all parameters. This precision is viewed as excellent and represents the benchmark of performance achieved by good laboratories.

TABLE 11: Precision Achievable by Participating Laboratories

Sample Number	Parameter	Target Value*	Units	Overall Median	Standard Deviation			
					All Data	Outer 20% Removed	Unflagged Data Only	USEPA**
SS1	S.Solids	22	mg/L	20.00	5.01	1.99	1.52	
SS2	S.Solids	12	mg/L	11.00	5.54	1.78	1.10	
SS3	S.Solids	29	mg/L	30.00	5.14	2.07	2.20	
SS4	S.Solids	22	mg/L	20.00	5.29	2.29	1.53	
SS5	S.Solids	0	mg/L	0.00	2.66	0.70	0.68	
SB1	S.Solids	45	mg/L	46.00	5.41	3.39	2.39	
SB2	S.Solids	38	mg/L	39.00	7.56	3.33	2.16	
SB3	S.Solids	55	mg/L	59.00	8.50	3.82	2.65	
SB4	S.Solids	45	mg/L	46.00	5.82	3.73	2.60	
BOD1	Total BOD	9	mg/L	10.00	32.04	1.61	1.00	1.45
BOD2	Total BOD	5	mg/L	5.32	5.05	1.14	0.82	1.05
BOD3	Total BOD	17	mg/L	18.00	25.93	3.25	1.91	2.25
BOD4	Total BOD	9	mg/L	10.00	26.77	1.68	1.08	1.45
SB1	Total BOD	32	mg/L	31.00	7.91	4.63	3.03	3.75
SB2	Total BOD	24	mg/L	25.00	9.25	4.63	2.90	2.95
SB3	Total BOD	35	mg/L	34.00	10.77	5.89	3.81	4.05
SB4	Total BOD	32	mg/L	31.40	11.85	4.77	2.58	3.75
TP1	Phosphorus	2.20	mg/L	2.00	0.57	0.43	0.14	0.12
TP2	Phosphorus	1.03	mg/L	1.00	0.30	0.19	0.070	0.061
TP3	Phosphorus	1.56	mg/L	1.50	0.39	0.27	0.095	0.089
TP4	Phosphorus	1.54	mg/L	1.48	0.40	0.29	0.089	0.088
TP5	Phosphorus	0	mg/L	0.03	0.70	0.046	0.018	0.055
TP6	Phosphorus	0.539	mg/L	0.52	0.21	0.116	0.047	0.034
TP7	Phosphorus	0.154	mg/L	0.16	0.13	0.059	0.019	0.014
TP8	Phosphorus	0.156	mg/L	0.16	0.57	0.052	0.020	0.014

TABLE 11 (Continued):

Sample Number	Parameter	Target Value*	Units	Overall Median	Standard Deviation			
					All Data	Outer 20% Removed	Unflagged Data Only	USEPA**
PH1	pH	7.4	pH units	7.45	0.12	0.058	0.028	0.069
PH2	pH	5.0	pH units	5.05	0.12	0.063	0.042	0.034
PH3	pH	8.4	pH units	8.30	0.24	0.185	0.095	0.084
PH4	pH	8.16 #	pH units	7.70	0.28	0.235	0.135	
PH5	pH	9.0	pH units	8.91	0.22	0.151	0.079	0.093
PH6	pH	9.46 ##	pH units	9.20	0.36	0.243	0.140	
PH7	pH	8.1 ###	pH units	8.06	0.26	0.198	0.108	
PH8	pH	6.4	pH units	6.43	0.11	0.060	0.030	0.055

*: Based on WTC lab results for BOD and Solids,
Calculated from reagents added for pH and Phosphorus
**: Calculated from USEPA precision functions as described in reference 9. Values were not calculated for the effluent samples or creek waters.
#: Skyway STP effluent, diluted by 1/3
##: Skyway STP effluent, undiluted
###: Spencer Creek water

5.0 CONCLUSIONS AND RECOMMENDATIONS

The performance of individual laboratories was assessed for each of the four parameters in this study. The assessment included an examination of the bias and precision assessed by the Youden technique as well as examination of graphs of the submitted results plotted against the interlaboratory mean values. From this assessment, individual laboratories were classed as "poor", "moderate" or "satisfactory". The moderate or satisfactory classifications would generally be considered acceptable laboratory performance.

For suspended solids, less than 10% of the labs were judged as biased and 82% of the labs fell into the moderate or satisfactory classes. A significant proportion of laboratories, however, submitted values above their method detection limits for the blank sample. This suggests that these participants have difficulty in reliably measuring solids in the low concentration range.

For BOD, 18% of the participants were judged as biased. Significantly more labs were biased low than were biased high. For all other parameters, there were approximately equal numbers of high and low biases. Seventy six percent of labs fell into the moderate or satisfactory classifications.

Nine percent of participants were judged as biased for pH, while 91% fell into the moderate or satisfactory categories.

For phosphorus, 17% of labs were assessed as biased and only 63% fell into the moderate or satisfactory classes. This means that the performance of 37% would be considered poor. Over one half of the participants reported values above their method detection limits for the blank sample.

The performance of the commercial and the non commercial lab sectors were compared by examining their mean and median results, the frequency of bias and imprecision and the number of labs generally performing poorly in each group. The results indicated that there were significantly more poor performers with respect to BOD and phosphorus in the non commercial sector than in the commercial sector.

The precision achieved by the participants as a group was examined and compared to that reported by the USEPA for their interlaboratory studies. We found that a central core of good laboratories acheived a level of precision equal to that reported by the USEPA. This excellent performance reflects the benchmark of performance that should be maintained in future interlaboratory studies. It should be noted, however, that the central core of good laboratories represents only 20 to 30% of all participants.

Based on these findings, we recommend the following:

1) We recommend that the findings of this report be distributed to the participants to allow lab staff involved in making measurements the opportunity to react to the findings and correct any problems that have been identified.

2) To rectify the apparent problems in the performance of BOD and phosphorus assays in the non commercial laboratories, additional training for lab staff at these facilities may be warranted. This could be carried out as part of an MOE training program or could be subcontracted.

3) In view of the generally poor performance of a large percentage of laboratories in carrying out phosphorus determinations, additional round robin type studies linked to training programs are recommended. These additional studies should address the problems of laboratory performance and possible deficiences of particular methods.

4) As these assessments were carried out using mainly synthetic samples, which should be simpler to analyse than real samples, we recommend that a followup study be carried out to assess performance on matrices which approximate those normally measured in the participating laboratories. This is of crucial importance in view of the serious implications that measurement errors would have on treatment plant operations and the determination of pollutant loadings to receiving waters.

6.0 REFERENCES

1) CC Westcott, pH Measurements, Academic Press, New York, 1978

2) KI Aspila and ASY Chau, "Assessing the performance of laboratories in large external quality assurance programs". NWRI contribution 90-135, National Water Research Institute, Burlington, Ont., L7R 4A6

3) KI Aspila, A manual for effective interlaboratory quality assurance. NWRI contribution 89-99, National Water Research Institute, Burlington, Ont., L7R 4A6

4) WJ Youden, Ranking laboratories by round robin tests. In Precision Measurement and Calibration, HH Ku, Editor, NBS Special Publication 300, Vol 1, pp165-9 to 169-13, US Gov't Printing Office, Washington, DC, 1969

5) WJ Youden and EH Steiner, Statistical Manual of the Association of Official Analytical Chemists. AOAC, PO Box 540, B Franklin Station, Washington, DC, 20044, 1975

6) JL Clark. Evaluation of performance of laboratories determining water quality constituents through natural water samples whose true values are unknown. In Summary of Conference Presentations. Envirometrics 81, pp 54-55, Alexandria, Virginia, April, 1981

7) KI Aspila ,RE White and JL Clark, Quality assurance aspects of the International Joint Commision Great Lakes Monitoring Porgram. In ASTM Special Technical Publication 867, A symposium on quality assurance of environmental measurements, August, 1983, Boulder, Colorado, ASTM, Philadelphia, PA, 1985

8) GEP Box, WG Hunter and JS Hunter, Statistics for Experimenters. J Wiley and Sons, New York

9) Estimation of Generic Quality Control Limits for use in a Water Pollution Laboratory, USEPA, Cincinnati, 1989

7.0 APPENDICES

Appendix 1: List of Participants
Appendix 2: Summary of data for all parameters
Appendix 3: Youden assessments (Bias and Flag assignments)
Appendix 4: Comparison of laboratory performance
Appendix 5: Laboratory specific appraisals
Appendix 6: Graphics output
Appendix 7: Comparison of commercial and non commercial labs
Appendix 8: Correspondence with laboratories

MOE/CAEAL Study, APPENDICES

Appendix 1: PARTICIPATING COMMERCIAL LABS

A & L Canada Laboratories East, Inc.
211 Advance Blvd., Unit 8
Brampton, Ontario
L6T 4S8

Accurassay Laboratories Ltd.
3 Industrial Drive
Kirkland Lake, Ontario
PSN 3J1

Accutest Laboratories Ltd.
146 Colonade Road, Unit 8
Nepean, Ontario
K2E 7Y3

Alpha Laboratories Inc.
285 Lesmill Road
Don Mills, Ontario
M3B 2V1

Anamol Laboratories
83 Citation Dr., Unit 9
Concord, Ontario
L4K 2S4

ARECO Canada Inc.
28 Concourse Gate
Nepean, Ontario
K2E 7T7

Barringer Laboratories Ltd.
5735 McAdam Road
Mississauga, Ontario
L4Z 1N9

Beak Analytical Services
14 Abacus Road
Brampton, Ontario
L6T 5B7

Bondar-Clegg & Co Ltd
5420 Canotek Rd.
Gloucester, Ontario
K1J 9G2

Pulp & Paper Research Institute
570 St. John's Blvd.
Pointe Claire, Quebec
H9R 3J9

Canviro Analytical Laboratories Ltd.
50 Bathurst Drive, Unit 12
Waterloo, Ontario
N2V 2C5

Laboratory Services
Canadian Operations
Clayton Environmental Consultants
949 McDougall Avenue
Windsor, Ontario
N9A 1L9

Conestoga-Rovers & Associates Ltd.
86 Rankin Street
Waterloo, Ontario
N2V 1V9

Environmental Services Lab
2800 Montreal Road
Cornwall, Ontario
K6H 6N8

Dillon Environmental Laboratories
215 Traders Boulevard East
Mississauga, Ontario
L4Z 2E5

Dillon Mills Laboratories Inc.
348 Centre St.
Petrolia, Ontario
N0N 1R0
P78 5E1

EAG Analytical Services
475 Cochrane Drive, Unit 13
Markham, Ontario
L3R 9R5

Enviroclean
921 Leathorne Street
London, Ontario
N5Z 3M7

Fine Analysis Laboratories
83 Bigwin Rd., Unit 8, Hannon
Hamilton, Ontario
L0R 1P0

Analytical Laboratory
Gore & Storrie Research Centre
55 Research Road
Toronto, Ontario
M4G 2G8

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Integrated Explorations
189 McCurdy Road
Guelph, Ontario
N1H 6N8

Lakefield Research
185 Concession St.
Lakefield, Ontario
K0L 2H0

Lambton Scientific
391 Vidal Street South
Sarnia, Ontario
N7T 7L1

Microbe Incorporated
85 Midpark Road
London, Ontario
N6N 1B2

Norlab Environmental Services Inc.
Lakehead University
Oliver Road
Thunder Bay, Ontario

Ortech International
2395 Speakman Drive
Mississauga, Ontario
L5K 1B3

Paracel Laboratories Ltd.
2319 St. Laurent Blvd., Unit 100
Ottawa, Ontario
K1G 4K6

Pollutech Environmental Ltd.
768 Westgate Rd.
Oakville, Ontario
L6L 5N2

Polytechnic Laboratories Ltd
1947 Mattawa Avenue
Mississauga, Ontario
L4X 1K8

Proctor & Redfern Ltd.
45 Green Belt Dr.
Toronto, Ontario
M3C 3K3

Room FG11, Frost Building
Department of Chemistry
Queen's University
Kingston, Ontario
K7L 3N6

R and R Laboratories
c/o Chemistry Department, Trent University
Peterborough, Ontario
K9J 7B8

R.D. Pickard Environmental Centre
655 Shefford Rd.
Gloucester, Ontario
K1J 8G8

Retek Resource Recovery Inc.
66 Mohawk Street, Unit 18
Brantford, Ontario
N3S 2W3

Technical Services Laboratories
1301 Fewster Dr.
Mississauga, Ontario
L4W 1A2

Technitrol Expertise Inc.
637 Petrolia Road
Downsview, Ontario
M3J 2X8

Thunder Bay Analytical Laboratories Inc.
1081 Barton Street
Thunder Bay, Ontario
P7B 5N3

Walker Laboratories
2800 Townline Road
Thorold, Ontario
L2V 3Y8

XRAL Environmental
Division of SGS Supervision Services Ltd.
1903 Leslie Street
Don Mills, Ontario
M3B 2M3

Analytical Services Division
Zenon Environmental Inc.
5555 North Service Road
Burlington, Ontario
L7L 5H7

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PARTICIPATING NON COMMERCIAL LABS

Alliston WPCP
R.R. 2, Concession 3
Alliston, Ontario
L0M 1A0

Aylmer Lagoon
Elgin Area Water System
Lakeshore Road
(5 km east of Port Stanley)
St. Thomas, Ontario
N5P 3V6

Batawa WPCP
Bay Street
Trenton, Ontario
K8V 5R5

Brantford WPCP
Ontario Ministry of Environment
Mohawk Street
Brantford, Ontario
N3T 5S1

Sewer Use Control
City of Brantford
c/o Sewage Treatment Plant, Mohawk Road
Brantford, Ontario
N3T 5L5

Guelph Water Pollution Control Plant
544 Wellington Street W.
Guelph, Ontario
N1H 3K5

Greenway Pollution Control Centre
109 Greenside Avenue
London, Ontario

City of Thunder Bay, WPCP
500 East Donald Street
Thunder Bay, Ontario
P7E 5V3

Collingwood Water Pollution Control Plant
3 Birch Street
Collingwood, Ontario
L9Y 2T8

Corbett Creek WPCP
2595 Thickson Road, RR#2
Whitby, Ontario
L1N 5R5

West Windsor Pollution Control Plant
4155 Ojibway Parkway
Windsor, Ontario
N9C 4A5

Corunna P.V. WPCP
Beresford Street North
Corunna, Ontario
N0N 1G0

Dresden WPCP
Camden Street
Dresden, Ontario
N0P 1M0

Ear Falls Water Treatment Plant
Gold Pines Road
Ear Falls, Ontario
P0V 1T0

Edwardsburgh WPCP
HIGHWAY 2 EAST
Prescott, Ontario
K0E 1T0

Elliot Lake Water Treatment Plant
200 Spane Road
Elliot Lake, Ontario
P5A 1X2

Frankford Water Pollution Control Plant (MOE)
56 Trent Street North
Frankford, Ontario
K0K 2C0

Goderich Pollution Control Plant
211 Sunset Drive
Goderich, Ontario
N7A 4C7

Highland Creek Treatment Plant
51 Beech Grove Drive
Scarborough, Ontario
M1E 3Z3

Humber Water Treatment Plant
130 The Queensway
Toronto, Ontario
M8Y 1H9

Innisfil WPCP
Moyer Ave. and 6th Conces.,
Innisfil Township
Lefroy, Ontario
L0L 1W0

MOE/CAEAL Study, APPENDICES

Marathon Water Pollution Control Plant
41 Howe Street
Marathon, Ontario
P0T 2E0

Merrickville WPCP
Hwy #2 East
Prescott, Ontario
K0E 1T0

Dee Avenue Laboratories
Metro Toronto Department of Works
30 Dee Avenue
Weston, Ontario
M9N 1S9

Millbrook WPCP
25 Centennial Lane
(c/o Ministry of Environment, Box #340)
Millbrook, Ontario
L0A 1G0

Ministry of Environment
3 Deloro Road
Deloro, Ontario
K0K 2M0

Haldimand Norfolk Water Supply
Ministry of Environment
Regional Road #55, Concess.#1, Lot#6
Nanticoke, Ontario
N0A 1L0

MOE Lakeview Water Pollution Control Plant
1300 Lakeshore Rd. East
Mississauga, Ontario
L5E 1E9

Moosonee Water Pollution Control Plant
Ministry of Environment
Resources Road
Moosonee, Ontario
P0L 1Y0

Municipality of Metropolitan Toronto
Laboratory, Main Treatment Plant
9 Leslie Street
Toronto, Ontario

Nakina WPCP
P.O. BOX 63, River Road
Nakina, Ontario
P0T 2H0

Napanee Water Pollution Control Plant
75 East Street
Napanee, Ontario
K7R 1S3

Petawawa WPCP
1 East Street South
Petawawa, Ontario
K8H 2X4

Peterborough Wastewater Treatment Plant
Sharon Avenue
Peterborough, Ontario
K9H 3R9

Port Hope Water Pollution Control Plant
Lake Street
Port Hope, Ontario
L1A 3V9

Preston Water Pollution Control Plant
395 Montrose Street South
Cambridge, Ontario
N3H 4S1

Pringle Creek WPCP No 1
2595 Thickson Road South, RR#2
Whitby, Ontario
L1N 5R5

Pringle Creek WPCP NO 2
2595 Thickson Road South, RR#2
Whitby, Ontario
L1N 5R5

Regional Lab of Hamilton-Wentworth
700 Woodward Avenue
Hamilton, Ontario
L8H 6P4

Skyway WWTP, Laboratory
1125 Lakeshore Blvd.
Burlington, Ontario

Seaway Pollution Control Plant
30 Prosperity Avenue
Port Colborne, Ontario
L3K 5X9

Stratford WPCP
Ministry of the Environment
701 West Gore Street
Stratford, Ontario
M5A 6S8

Town of Strathroy
475 Metcalfe Street West
Strathroy, Ontario
N7G 1N8

Arnprior Sewage Treatment Plant
233 Albert Street
Arnprior, Ontario
K7S 2M4

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Town of New Liskeard
200 Lakeshore Road
New Liskeard, Ontario
P0J 1P0

Trenton WPCP
Bay Street
Trenton, Ontario
K8V 5R5

Main Street Water Pollution Control Plant
Main Street
Penetanguishene, Ontario
L0K 1P0

Tottenham Lagoon
Village of Tottenham
18 Queen Street N.
Tottenham, Ontario
L0G 1W0

Waterloo WPCP
190 University Ave. E.
Waterloo, Ontario
N2J 3Z9

West End Sewage Plant
55 Allen's Side Road
Sault Ste Marie, Ontario
P6A 5L2

Wheatly WPCP
1st Concession Road, Wheatley
(1.5 miles south of Wheatley, off Kent Road #1)
Wheatley, Ontario

Whitney & Tisdale WPCP
220 Algonquin East
Timmins, Ontario
P4N 1B3

MOE/CAEAL Study, APPENDICES

Appendix 2: SUMMARY OF DATA FOR ALL PARAMETERS

DATA SUMMARY

MISA INTERLAB STUDY 01 SS

PARAMETER: SUSPENDED SOLIDS MG/L

SAMPLE RESULTS

LAB	SS1	SS2	SS3	SS4	SS5	SB1	SB2	SB3	SB4
W0009	16.	32.	29.	19.	.0	45.	40.	58.	48.
W0023	14.	4.	26.	16.	2.	40.	36.	54.	42.
W0028	18.6	10.9	28.	18.6	.0	45.	38.6	44.4	58.
W0042	20.	10.	28.	20.	.0	48.	42.	62.	50.
W0072	24.	13.	34.	21.	1.	48.	42.	61.	50.
W0127	17.	9.	26.	18.	.0	43.	36.	55.	43.
W0147	20.	11.	31.	22.	.0	47.	36.	65.	47.
W0148	21.	11.	31.	21.	.0	45.	40.	60.	44.
W0149	22.	12.	33.	23.	2.	46.	41.	60.	47.
W0179	16.5	9.	14.	36.5	.5	44.5	34.	56.5	44.
W0198	18.	6.	29.	14.	.0	43.	35.	57.	44.
W0211	20.	11.	30.	20.	.0	43.	36.	57.	42.
W0238	24.	12.	32.	22.	.0	49.	42.	62.	50.
W0239	19.	11.	26.	24.	.0	45.	42.	59.	39.
W0243	21.	11.7	31.5	20.	.0	43.	39.	56.	40.
W0247	20.	4.	22.	14.	.0	30.	30.	50.	30.
W0248	23.	13.	32.	22.	.0	51.	41.	64.	51.
W0255	27.	10.	31.	24.	-1.	35.	40.	56.	46.
W0266	21.	14.	31.	38.	4.	46.	39.	61.	45.
W0305	21.	12.	31.	21.	.0	44.	38.	59.	46.
W0335	16.	10.	31.	11.	.0	34.	28.	58.	44.
W0337	29.2	20.	38.8	30.	2.8	54.8	50.8	64.8	54.
W0364	18.	10.	28.	19.	.0	43.	36.	55.	43.
W0370	20.	11.	28.	18.	1.	43.	36.	60.	46.
W0377	50.	42.	59.	46.	12.	34.	38.	82.	59.
W0380	19.	8.75	28.8	18.4	.0	46.8	33.6	38.4	50.4
W0390	21.0	11.4	32.4	22.0	.0	48.4	41.4	61.2	48.0
W0404	14.	18.	22.	17.	.0	38.	32.	50.	37.
W0417	23.	9.	32.	24.	< 2.	46.	40.	60.	42.
W0418	18.	12.	27.	20.	< 5.	48.	41.	65.	48.
W0427	21.	12.	33.	23.	.0	55.	48.	73.	54.
W0428	19.	10.	28.	19.	< 1.	44.	34.	52.	41.
W0429	17.	9.	31.	20.	< 1.	52.	48.	58.	43.
W0430	15.	6.	23.	14.	1.	45.	36.	55.	40.
W0431	20.	11.	32.	22.	< 5.	47.	40.	54.	57.
W0433	19.	12.	28.	19.	< 1.	39.	36.	54.	41.
W0439	21.	7.	31.	22.	< 1.	36.	43.	41.	38.
W0441	21.	13.	29.	21.	.0	46.	38.	50.	45.
W0447	24.	16.	33.	27.	4.	60.	41.	65.	35.
W0448	18.	12.	28.	21.	< 5.	45.	39.	58.	44.
W0456	15.	1.	31.	16.	< 1.	37.	17.	44.	37.
W0460	19.	10.	32.	21.	.0	50.	42.	60.	46.
W0462	20.	26.	40.	21.	2.	56.	42.	98.	56.
W0463	20.	12.	30.	20.	.0	45.	37.	54.	44.
W0464	14.	11.	27.	15.	< 3.	38.	36.	55.	44.
W0468	20.	10.	26.5	16.	< .5	43.	39.	53.	49.
W0471	21.79	13.16	31.26	21.45	.11	47.28	42.25	62.23	49.64
W0476	19.	9.	26.	16.	< 1.	40.	36.	58.	39.
W0477	20.	11.	30.	20.	.0	48.	39.	60.	47.
W0480	3.	12.	30.	21.	< 3.	47.	41.	61.	47.
W0482	20.	11.	29.	20.	< 1.	52.	40.	57.	47.
W0485	20.	11.	34.	18.	< 1.	50.	41.	63.	51.
W0489	19.6	11.2	28.6	19.8	.0	46.	37.2	56.8	45.4
W0493	16.	9.	20.	18.	< 2.	44.	44.	63.	48.

DATA SUMMARY

MISA INTERLAB STUDY 01 SS

PARAMETER: SUSPENDED SOLIDS MG/L

SAMPLE RESULTS

LAB	SS1	SS2	SS3	SS4	SS5	SB1	SB2	SB3	SB4
W0497	19.	11.	27.	22.	< 1.	47.	39.	61.	48.
W0498	16.	6.	25.	15.	.0	44.	37.	61.	41.
W0506	20.	11.	30.	19.	< 1.	47.	39.	60.	46.
W0511	21.	12.	32.	20.	.0	48.	40.	62.	49.
W0514	21.	13.	32.	22.	.0	48.	82.	61.	46.
W0516	17.	9.	27.	18.	2.	46.	38.	59.	47.
W0524	20.	14.3	30.5	13.1	2.	45.	55.	75.	60.
W0526	16.4	12.9	28.4	23.2	.0	54.7	51.8	60.8	48.
W0528	20.	12.	28.	18.	< 2.	45.	37.	58.	45.
W0529	23.	13.	30.	21.	.0	50.	46.	66.	48.
W0533	20.	12.	29.	16.	.0	49.	38.	61.	50.
W0535	20.6	12.	31.6	20.4	13.7	45.2	49.	60.6	35.8
W0538	20.	14.3	30.5	17.	.0	48.	53.	75.	61.
W0542	20.	12.	27.	20.	< 1.	40.	36.	57.	42.
W0551	13.	12.	29.	20.	< 1.	51.	32.	51.	42.
W0552	19.	10.	30.	20.	.0	46.	39.	46.	46.
W0999	19.2	8.4	27.4	16.	.0	36.	38.5	58.	44.5
TOTAL LABS REPORTING	71	71	71	71	71	71	71	71	71
TOTAL LABS USED	71	71	71	71	50	71	71	71	71
MEAN	19.70268	11.81704	29.69380	20.44296	.98220	45.33352	39.87535	58.99620	45.98225
STD DEV	5.01269	5.53712	5.14144	5.29284	2.66327	5.41099	7.56100	8.49565	5.82389
MEDIAN VALUES	20.00000	11.00000	30.00000	20.00000	.00000	46.00000	39.00000	59.00000	46.00000

DATA SUMMARY

MISA INTERLAB STUDY 02 BOD

PARAMETER: BIOCHEMICAL DEMAND MG/L

SAMPLE RESULTS

LAB	BOD1	BOD2	BOD3	BOD4	SB1	SB2	SB3	SB4
W0042	10.	5.	16.	8.	50.	37.	56.	50.
W0072	6.	3.	14.	6.	25.	19.	27.	24.
W0147	5.	2.	14.	6.	23.	20.	27.	24.
W0148	6.	4.	13.	7.	19.	17.	24.	22.
W0149	6.	3.	11.	5.	25.	16.	27.	25.
W0211	10.	7.	20.	11.	39.	29.	41.	37.
W0238	10.	7.	18.	10.	30.	23.	31.	31.
W0239	12.	8.	24.	11.	42.	31.	53.	45.
W0243	11.	12.	20.	11.	40.	30.	36.	40.
W0248	9.	6.	17.	11.	27.	19.	28.	30.
W0255	250.	40.	210.	210.	10.	60.		
W0335	8.	3.	8.	4.	35.	25.	.0	40.
W0337	9.	5.	19.	9.	26.	22.	31.	25.
W0364	10.	5.	18.	9.	32.	23.	28.	32.
W0404	9.	6.	12.	9.	23.	40.	48.	52.
W0417	9.	6.	20.	8.	33.	27.	41.	30.
W0418	7.	< 5.	11.	7.	27.	15.	24.	25.
W0427	7.2	3.4	12.0	7.2	24.6	18.9	31.5	22.8
W0428	4.	< 2.	14.	5.	32.	23.	35.	31.
W0429	12.	11.	25.	18.	36.	34.	57.	42.
W0430	8.7	5.4	17.5	10.	31.2	26.	37.	31.8
W0431	10.	6.	20.	8.	35.	26.	40.	34.
W0433	7.	5.	16.	8.	35.	24.	37.	37.
W0439	25.	3.8	31.	6.4	27.	23.	28.	31.
W0441	9.	5.	18.	9.	30.	20.	34.	29.
W0447	9.	5.	19.	8.	36.	25.	24.	30.
W0456	5.	1.	6.	1.	30.	16.	30.	30.
W0460	8.	5.	16.	8.	26.	19.	29.	27.
W0462	10.	6.	20.	10.	30.	25.	40.	32.
W0463	10.	5.	22.	10.	37.	29.	44.	37.
W0464	7.	3.	13.	6.	25.	21.	32.	27.
W0468	8.32	5.32	21.64	12.21	21.4	55.22	23.3	28.82
W0471	6.12	3.38	8.67	6.95	17.49	7.57	20.28	17.67
W0476	10.	6.	23.	11.	38.	28.	44.	36.
W0477	9.	6.	17.	9.	37.	33.	37.	32.
W0480	11.	6.	20.	11.	29.	24.	36.	30.
W0482	8.	5.	17.	10.	29.	26.	34.	30.
W0485	9.	6.	17.	12.	29.	39.	32.	47.
W0489	16.	5.8	15.7	10.7	57.6	48.5	74.	100.
W0493	10.	5.	17.	10.	31.	26.	35.	32.
W0497	10.	5.	19.	11.	38.	32.	42.	37.
W0498	10.	7.	19.	10.	28.	27.	34.	30.
W0506	10.	5.	19.	11.	30.	25.	35.	31.
W0511	10.	4.	14.	8.	33.	23.	34.	30.
W0514	5.	2.	16.	7.	27.	21.	33.	62.
W0516	10.	5.	19.	10.	36.	25.	22.	30.
W0524	12.	7.	20.	11.	36.	28.	42.	35.
W0526	9.5	6.9	15.6	10.2	34.5	30.5	33.	32.5
W0528	2.	2.	8.	9.	26.	21.	33.	26.
W0529	18.	6.8	24.8	22.5	49.5	46.5	25.5	39.
W0533	8.	5.	14.	9.	25.	25.	36.	28.
W0535	16.	7.	26.	6.	26.	24.	31.	30.
W0538	11.	6.	22.	11.	38.	27.	42.	31.

DATA SUMMARY

MISA INTERLAB STUDY 02 BOD

PARAMETER: BIOCHEMICAL DEMAND MG/L

SAMPLE RESULTS

LAB	BOD1	BOD2	BOD3	BOD4	SB1	SB2	SB3	SB4
W0542	11.	6.	21.	11.	35.	28.	42.	36.
W0551	11.	7.	25.	12.	37.	29.	48.	32.
W0552	10.	6.	20.	11.	35.	27.	41.	39.
W0999	11.3	6.8	20.3	10.9	36.	28.	42.	40.

TOTAL LABS REPORTING	57	57	57	57	57	57	57	57
TOTAL LABS USED	57	55	57	57	57	57	56	56
MEAN	13.70421	5.99273	20.95105	12.80807	31.58404	26.96825	35.20679	34.26054
STD DEV	32.04329	5.05418	25.93492	26.76622	7.90829	9.24971	10.77090	11.85153
MEDIAN	10.00000	5.32000	18.00000	10.00000	31.00000	25.00000	34.00000	31.40000

DATA SUMMARY

MISA INTER LAB STUDY NO.03 PH

PARAMETER: PH PH UNITS

SAMPLE RESULTS

LAB	PH1	PH2	PH3	PH4	PH5	PH6	PH7	PH8
W0009	7.46	5.15	8.46	7.80	8.95	9.00	8.09	6.45
W0010	7.25	5.0	8.15	7.55	8.65	9.15	7.9	6.3
W0017	7.51	5.00	7.80	7.50	8.48	8.94	7.62	6.28
W0021	7.4	5.1	8.4	8.0	9.0	9.5	8.1	6.4
W0023	7.30	5.05	8.35	7.45	8.95	9.07	7.80	6.28
W0028	7.45	5.9	8.5	7.61	8.95	9.45	8.25	6.6
W0042	7.30	5.00	8.10	7.70	8.72	9.50	8.00	6.40
W0072	7.45	5.00	8.30	7.90	8.90	9.40	8.25	6.45
W0127	7.37	5.00	7.68	7.48	8.84	9.02	8.04	6.38
W0147	7.46	4.95	8.58	8.09	9.15	9.75	8.17	6.41
W0148	7.36	4.98	8.44	7.61	9.07	9.42	7.87	6.39
W0149	7.47	5.04	8.51	7.50	8.99	9.37	8.40	6.48
W0179	7.5	5.1	8.44	7.4	8.9	9.3	8.0	6.5
W0190	7.43	5.10	8.45	7.68	8.97	9.20	8.07	6.45
W0198	7.64	5.25	8.57	7.89	9.11	9.70	8.25	6.57
W0211	7.47	5.08	7.92	7.57	8.64	9.02	7.80	6.44
W0233	7.4	5.0	7.9	7.3	8.4	8.9	7.2	6.2
W0238	7.45	5.10	8.50	7.75	9.0	9.50	8.05	6.45
W0239	6.73	4.87	8.5	7.69	8.71	9.18	7.91	5.84
W0247	7.50	5.15	8.40	8.00	9.00	9.00	8.20	6.60
W0248	7.75	5.25	8.20	7.10	9.00	9.20	7.90	6.60
W0255	7.45	5.00	8.07	7.45	8.73	8.80	7.77	6.39
W0266	7.36	5.15	8.02	7.49	8.46	8.86	8.06	6.44
W0305	7.36	5.15	8.02	7.49	8.46	8.86	8.06	6.44
W0335	7.5	5.1	7.8	7.4	8.6	8.9	7.6	6.5
W0336	7.67	5.17	8.52	7.65	8.98	9.54	7.97	6.46
W0337	7.42	5.06	8.13	7.68	8.79	9.30	8.01	6.40
W0364	7.50	5.1	8.1	7.7	8.8	7.9	7.9	6.4
W0370	7.4	5.0	8.6	7.5	8.8	9.0	7.8	6.4
W0377	7.4	5.2	8.4	8.0	8.9	9.2	7.7	6.4
W0380	7.52	5.28	8.31	8.18	9.08	9.42	8.35	6.55
W0382	7.4	5.0	8.2	7.7	8.7	8.8	8.2	6.6
W0389	7.45	5.08	8.37	7.80	9.00	9.58	8.12	6.45
W0404	7.4	5.0	8.2	7.1	9.0	9.0	7.6	6.3
W0417	7.40	4.90	8.14	7.52	8.80	9.16	7.57	6.33
W0418	7.47	5.05	8.54	8.00	9.09	9.60	8.29	6.39
W0427	7.29	4.99	8.03	7.57	8.70	9.24	7.72	6.38
W0428	7.5	5.1	8.5	8.1	9.1	9.6	8.2	6.5
W0429	7.44	4.99	8.24	7.45	8.91	8.26	8.06	6.39
W0431	7.24	5.04	8.09	7.47	8.68	8.73	7.86	6.33
W0433	7.44	5.01	8.06	7.70	8.76	8.89	7.89	6.39
W0439	7.17	5.12	8.21	7.90	8.74	9.29	8.21	6.59
W0441	7.56	5.03	8.82	8.32	9.50	10.17	8.36	6.41
W0447	7.5	5.0	8.2	7.8	8.8	9.3	7.7	6.4
W0448	7.44	5.04	8.38	7.60	8.96	9.19	8.24	6.45
W0456	7.63	5.12	8.28	7.85	9.07	9.46	8.00	6.62
W0460	7.46	5.01	8.36	8.02	9.00	9.52	8.05	6.41
W0462	7.48	5.02	8.50	8.01	9.07	9.62	8.15	6.44
W0463	7.43	5.05	8.48	8.06	9.06	9.52	8.27	6.47
W0464	7.4	5.0	8.3	8.0	9.0	9.4	8.1	6.5
W0468	7.54	5.06	8.57	8.28	9.12	9.00	8.35	6.44
W0469	7.474	5.067	8.505	8.088	9.048	9.401	8.246	6.420
W0471	7.26	5.60	7.77	7.35	8.25	8.60	7.44	6.55
W0476	7.45	5.06	8.26	7.92	8.93	9.07	8.10	6.45

DATA SUMMARY

MISA INTER LAB STUDY NO.03 PH

PARAMETER: PH PH UNITS

SAMPLE RESULTS

LAB	PH1	PH2	PH3	PH4	PH5	PH6	PH7	PH8
W0477	7.45	5.01	8.21	8.00	8.9	9.3	8.13	6.42
W0480	7.42	5.04	8.36	7.95	8.89	9.41	8.13	6.42
W0482	7.42	5.08	8.09	7.56	8.69	8.78	7.99	6.43
W0489	7.43	5.03	8.28	7.69	8.80	9.41	8.16	6.48
W0493	7.47	5.03	8.48	8.02	9.04	9.56	8.15	6.43
W0497	7.43	5.05	8.43	7.63	8.96	9.26	8.16	6.44
W0498	7.37	4.97	7.80	7.30	8.61	8.95	7.54	6.35
W0506	7.60	5.40	8.25	8.00	8.90	9.00	8.40	6.80
W0511	7.50	5.15	8.25	7.75	8.85	9.20	7.75	6.45
W0514	7.42	5.06	8.35	7.74	9.01	9.20	8.28	6.40
W0515	7.54	4.94	8.16	7.24	8.81	9.13	7.48	6.34
W0516	7.48	5.10	8.42	8.05	8.93	9.01	8.38	6.44
W0524	7.46	5.01	7.95	7.40	8.61	8.87	7.90	6.38
W0526	7.42	5.04	8.37	7.91	8.91	9.08	8.23	6.42
W0528	7.47	5.07	8.45	7.98	9.05	9.60	8.05	6.50
W0529	7.46	5.07	8.47	8.02	9.01	9.57	8.21	6.46
W0533	7.31	5.49	7.65	7.11	8.25	8.46	7.40	6.45
W0535	7.39	5.00	8.30	7.93	8.88	9.38	8.09	6.37
W0538	7.38	5.01	7.86	7.27	8.55	8.80	7.84	6.27
W0542	7.458	5.051	8.431	8.154	9.004	9.420	8.286	6.417
W0551	7.47	5.05	8.47	7.62	9.03	9.28	8.17	6.44
W0552	7.50	4.98	8.40	7.86	9.06	9.63	8.21	6.42
W0999	7.37	4.97	8.15	7.25	8.79	8.99	7.93	6.43
TOTAL LABS REPORTING	77	77	77	77	77	77	77	77
TOTAL LABS USED	77	77	77	77	77	77	77	77
MEAN	7.43210	5.08075	8.26891	7.71626	8.86756	9.19534	8.00886	6.42879
STD DEV	.12314	.14832	.24074	.29015	.21416	.35331	.25908	.11285
MEDIAN	7.45000	5.05000	8.30000	7.70000	8.91000	9.20000	8.06000	6.43000

DATA SUMMARY

MISA INTER LAB STUDY NO.04 TOT P

PARAMETER: TOTAL PHOSPHORUS-STP MG P/L

SAMPLE RESULTS

LAB	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8
W0009	2.05	1.01	1.54	1.49	.00	.50	.16	.15
W0017	1.0	.83	1.0	1.0	.0	.60	.14	.15
W0023	2.30	1.083	1.66	1.517	.830	.54	.15	.125
W0028	2.15	1.05	1.55	1.55	.025	.55	.15	.12
W0042	2.00	1.05	1.49	1.51	.07	.64	.20	.25
W0072	2.16	1.02	1.55	1.54	< .02	.54	.17	.16
W0127	.92	.42	.68	.55	.10	.25	.05	< .01
W0147	1.80	.86	1.30	1.30	.08	.44	.14	.14
W0148	1.99	.97	1.49	1.43	.00	.51	.12	.14
W0149	2.21	1.06	1.85	1.52	.02	.57	.18	.20
W0179	.46	.56	.10	.11	.09	.02	.03	.00
W0198	.9	.8	.9	.9	.01	.5	.15	.16
W0211	2.07	1.00	1.50	1.47	.03	.50	.15	.13
W0233	2.00	1.00	1.50	1.42	.06	.56	.20	.16
W0238	2.12	1.19	1.77	1.74	.00	.61	.20	.21
W0239	2.25	1.0	1.5	1.58	.0	.53	.17	.12
W0243	2.01	1.15	1.57	1.64	.03	.65	.20	.16
W0247	1.80	.78	1.60	.70	.00	.00	.13	.10
W0248	2.25	.25	.67	.74	.00	.36	.03	.04
W0255	2.1	1.1	1.63	1.60	.06	.43	.16	.17
W0266	1.90	.99	1.44	1.44	.02	.46	.12	.15
W0305	1.90	.99	1.44	1.44	.02	.46	.12	.15
W0335	1.20	.83	.97	1.3	.0	.55	.32	.33
W0336	2.15	1.66	1.8	1.72	.50	1.07	.25	.20
W0337	2.23	1.10	1.62	1.59	.0	.58	.24	.21
W0364	1.936	1.016	1.408	1.536	.104	.327	.269	.267
W0370	2.0	.77	1.71	1.13	.02	.52	.07	.01
W0377	.9	.5	1.3	1.3	.07	.3	.2	.03
W0380	.9	.666	.766	.966	.16	.172	.08	.108
W0382	1.02	.83	1.16	.79	.02	.30	.07	.10
W0389	.16	.39	.99	.52	.00	.29	.09	.09
W0404	.76	.34	.50	1.06	.28	.42	.34	.32
W0417	1.42	.92	1.20	1.19	< .06	.51	.15	.15
W0418	1.99	1.02	1.54	1.48	< .05	.54	.17	.18
W0427	1.94	1.18	1.60	1.53	.03	.62	.14	.17
W0428	2.12	1.18	1.68	1.76	< .005	.752	.213	.199
W0429	1.96	1.00	1.46	1.45	.10	.56	.21	.24
W0431	2.18	1.04	1.50	1.53	.04	.54	.13	.12
W0433	2.01	1.11	1.64	1.63	.07	.61	.21	.26
W0439	1.7	.38	1.07	.66	5.1	.04	.83	4.95
W0441	2.03	.97	1.47	1.48	.01	.49	.18	.17
W0447	1.87	1.11	1.30	1.63	.03	.52	.17	.16
W0448	2.19	1.04	1.58	1.58	< .1	.56	.26	.17
W0456	2.48	1.07	1.79	1.82	< .01	.56	.19	.16
W0460	2.17	1.00	1.54	1.54	< .01	.52	.15	.17
W0462	2.23	1.03	1.59	1.55	< .001	.576	.158	.172
W0463	2.16	1.02	1.62	1.67	< .05	.526	.156	.136
W0464	.78	.33	.56	.62	< .01	.23	.03	.05
W0468	1.03	.68	.86	.85	< .001	.54	.14	.15
W0469	2.283	1.095	1.688	1.661	.075	.603	.377	.301
W0471	.45	.27	.23	.42	< .01	.16	.05	.05
W0476	1.71	.812	1.26	1.23	< .01	.452	.127	.124
W0477	2.20	1.163	1.683	1.663	.010	.590	.150	.210

DATA SUMMARY

MISA INTER LAB STUDY NO.04 TOT P

PARAMETER: TOTAL PHOSPHORUS-STP MG P/L

SAMPLE RESULTS

LAB	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8
W0480	1.98	.87	1.34	1.32	< .10	.36	< .10	< .10
W0482	2.09	1.42	1.53	2.20	.16	.20	.05	.05
W0489	.45	.43	.54	.30	.05	.05	.05	.05
W0493	2.19	.98	1.62	1.65	.08	.43	.13	.17
W0497	2.36	1.19	1.79	1.75	.12	.65	.29	.31
W0498	2.52	2.00	1.66	1.70	.00	1.46	.72	.11
W0506	2.10	1.10	1.60	1.45	< .05	.50	.15	.17
W0511	2.43	1.23	1.78	1.79	.15	.71	.33	.34
W0514	1.50	.90	.90	1.23	.02	.30	.14	.14
W0515	2.16	.96	1.55	1.53	< .1	.49	.14	.11
W0516	1.82	.94	1.37	1.43	< .01	.44	.12	.19
W0524	2.13	1.22	1.62	1.53	.23	.60	.30	.32
W0526	2.16	1.09	1.40	1.40	< .02	.58	.17	.17
W0528	1.10	.70	.94	.825	.004	.345	.1045	.0885
W0529	2.00	1.00	1.50	1.45	.01	.52	.16	.16
W0533	1.90	1.08	1.48	1.48	< .05	.58	.16	.17
W0535	2.20	1.11	1.58	1.70	.01	.67	.158	.154
W0538	2.00	1.20	1.59	1.50	.11	.48	.19	.18
W0542	2.22	1.05	1.60	1.51	< .03	.57	.16	.15
W0551	2.48	1.03	1.61	1.56	.01	.56	.19	.16
W0552	2.20	1.20	1.68	1.78	< .10	.80	.42	.20
W0999	2.08	.97	1.43	1.38	.00	.51	.14	.14
TOTAL LABS REPORTING	75	75	75	75	75	75	75	75
TOTAL LABS USED	75	75	75	75	54	75	74	73
MEAN	1.82092	.95140	1.37233	1.35344	.16700	.49404	.18260	.22568
STD DEV	.56100	.29389	.38359	.39974	.69723	.21154	.12619	.56520
MEDIAN	2.01000	1.00000	1.50000	1.48000	.03000	.52000	.15800	.16000

MOE/CAEAL Study, APPENDICES

Appendix 3: YOUDEN ASSESSMENTS (BIAS AND FLAG ASSIGNMENTS)

PARAMETER: 00100 SUSPENDED SOLIDS MG/L

RESEARCH AND APPLICATIONS BRANCH
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MISA INTERLAB STUDY 01 SS

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.00 BASIC ACCEPTABLE ERROR= 3.00 CONCENTRATION ERROR INCREMENT= .0500
LABORATORIES YET TO REPORT: W0336,W0382,W0011,W0233
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	SS1		SS2		SS3		SS4		SS5		SB1	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0009	16. L	9.50	32. EH	70.00	29.	31.50	19.	26.00	.0	18.50	45.	30.00
W0023	14. VL	4.00	4. EL	2.50	26.	8.50	16. L	10.50	2.	43.00	40. L	12.00
W0028	18.6	21.00	10.9	25.00	28.	21.50	18.6	23.00	.0	18.50	45.	30.00
W0042	20.	40.50	10.	20.50	28.	21.50	20.	35.50	.0	18.50	48.	53.00
W0072	24. H	67.00	13.	59.00	34.	67.50	21.	47.00	1.	39.00	48.	53.00
W0127	17.	15.00	9.	13.00	26.	8.50	18.	18.50	.0	18.50	43.	17.00
W0147	20.	40.50	11.	31.50	31.	48.00	22.	56.50	.0	18.50	47.	46.00
W0148	21.	55.50	11.	31.50	31.	48.00	21.	47.00	.0	18.50	45.	30.00
W0149	22.	62.00	12.	48.00	33.	65.00	23.	61.50	2.	43.00	46.	39.00
W0179	16.5	13.00	9.	13.00	14. EL	1.00	36.5 EH	69.00	.5	37.00	44.5	25.00
W0198	18.	18.50	6. VL	5.00	29.	31.50	14. VL	4.00	.0	18.50	43.	17.00
W0211	20.	40.50	11.	31.50	30.	38.00	20.	35.50	.0	18.50	43.	17.00
W0238	24. H	67.00	12.	48.00	32.	59.00	22.	56.50	.0	18.50	49.	58.50
W0239	19.	25.50	11.	31.50	26.	8.50	24. H	65.00	.0	18.50	45.	30.00
W0243	21.	55.50	11.7	40.00	31.5	54.00	20.	35.50	.0	18.50	43.	17.00
W0247	20.	40.50	4. EL	2.50	22. VL	3.50	14. VL	4.00	.0	18.50	30. EL	1.00
W0248	23.	64.00	13.	59.00	32.	59.00	22.	56.50	.0	18.50	51.	63.50
W0255	27. VH	69.00	10.	20.50	31.	48.00	24. H	65.00	-1.	1.00	35. EL	4.00
W0266	21.	55.50	14.	63.00	31.	48.00	38. EH	70.00	4.	47.50	46.	39.00
W0305	21.	55.50	12.	48.00	31.	48.00	21.	47.00	.0	18.50	44.	22.50
W0335	16. L	9.50	10.	20.50	31.	48.00	11. EL	1.00	.0	18.50	34. EL	2.50
W0337	29.2 EH	70.00	20. EH	68.00	38.8 EH	69.00	30. EH	68.00	2.8	46.00	54.8 VH	68.00
W0364	18.	18.50	10.	20.50	28.	21.50	19.	26.00	.0	18.50	43.	17.00
W0370	20.	40.50	11.	31.50	28.	21.50	18.	18.50	1.	39.00	43.	17.00
W0377	50. EH	71.00	42. EH	71.00	59. EH	71.00	46. EH	71.00	12.	49.00	34. EL	2.50
W0380	19.	25.50	8.75	9.00	28.8	28.00	18.4	22.00	.0	18.50	46.8	43.00
W0390	21.0	55.50	11.4	39.00	32.4	63.00	22.0	56.50	.0	18.50	48.4	57.00
W0404	14. VL	4.00	18. EH	67.00	22. VL	3.50	17.	14.50	.0	18.50	38. VL	8.50
W0417	23.	64.00	9.	13.00	32.	59.00	24. H	65.00	<2.	.00	46.	39.00
W0418	18.	18.50	12.	48.00	27.	14.00	20.	35.50	<5.	.00	48.	53.00
W0427	21.	55.50	12.	48.00	33.	65.00	23.	61.50	.0	18.50	55. VH	69.00
W0428	19.	25.50	10.	20.50	28.	21.50	19.	26.00	<1.	.00	44.	22.50
W0429	17.	15.00	9.	13.00	31.	48.00	20.	35.50	<1.	.00	52. H	65.50
W0430	15. L	6.50	6. VL	5.00	23. VL	5.00	14. VL	4.00	1.	39.00	45.	30.00
W0431	20.	40.50	11.	31.50	32.	59.00	22.	56.50	<5.	.00	47.	46.00
W0433	19.	25.50	12.	48.00	28.	21.50	19.	26.00	<1.	.00	39. L	10.00
W0439	21.	55.50	7. L	7.00	31.	48.00	22.	56.50	<1.	.00	36. VL	5.50
W0441	21.	55.50	13.	59.00	29.	31.50	21.	47.00	.0	18.50	46.	39.00
W0447	24. H	67.00	16. VH	66.00	33.	65.00	27. VH	67.00	4.	47.50	60. EH	71.00
W0448	18.	18.50	12.	48.00	28.	21.50	21.	47.00	<5.	.00	45.	30.00
W0456	15. L	6.50	1. EL	1.00	31.	48.00	16. L	10.50	<1.	.00	37. VL	7.00
W0460	19.	25.50	10.	20.50	32.	59.00	21.	47.00	.0	18.50	50.	61.00
W0462	20.	40.50	26. EH	69.00	40. EH	70.00	21.	47.00	2.	43.00	56. VH	70.00
W0463	20.	40.50	12.	48.00	30.	38.00	20.	35.50	.0	18.50	45.	30.00
W0464	14. VL	4.00	11.	31.50	27.	14.00	15. L	6.50	<3.	.00	38. VL	8.50
W0468	20.	40.50	10.	20.50	26.5	11.00	16. L	10.50	<.5	.00	43.	17.00
W0471	21.79	61.00	13.16	62.00	31.26	53.00	21.45	52.00	.11	36.00	47.28	49.00
W0476	19.	25.50	9.	13.00	26.	8.50	16. L	10.50	<1.	.00	40. L	12.00
W0477	20.	40.50	11.	31.50	30.	38.00	20.	35.50	.0	18.50	48.	53.00
W0480	3. EL	1.00	12.	48.00	30.	38.00	21.	47.00	<3.	.00	47.	46.00

CRITERIA USED TO PREPARE STATEMENTS FOR THE AUTOMATED APPRAISALS

Note: Please refer to the "Glossary of Terms" and associated references for an explanation of A) How the non-parametric process of ranking is able to discern bias in a laboratory data set and B) The calculation and conditions that warrents a reported result to be flagged L, H, VL or VH.

Status of Data Refer to Appendix -Data Files	Statement Produced in Appraisal (Appendix)
1(A) No flags, no bias in the data.	Satisfactory.
(B) No bias, only 1 minor flag (H or L).	Satisfactory except for low/high flag on sample _.
2. No data or results reported by laboratory.	No results reported.
3. Data reported on less than half of the samples, no results flagged.	Insufficient data to assess bias.
4. Same as item 3, but some results are flagged.	Flagged __ on sample __,__ and flagged __ on sample __. Insufficient data to assess bias.
5. No results are flagged but data set identified as biased high or low.	Although no results are flagged, ranking indicates results are biased high/low.
6. Some results are flagged, the data set is discerned as biased.	Flagged __ on sample __,__; Flagged __ on sample __,__. Ranking indicates results are biased.
7. Some results are flagged.	Flagged __ on samples __,__ and flagged __ on samples __.
8. No bias statement but two or three results are flagged, one is very high, the other is very low.	Flagged very high on sample __ and very low on sample __. These results are slightly erratic.
9. No bias statement but two or more results are flagged very high and and two or more results are flagged very low.	Flagged very high on samples __,__ and flagged very low on samples __,__,__. These results are erratic.
10. Results are ranked, the data set is not biased but one result is flagged very high or very low.	Flagged __ on sample __. This extreme result suggests the measurement process is out of control.

PARAMETER: 00100 SUSPENDED SOLIDS MG/L

RESEARCH AND APPLICATIONS BRANCH
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MISA INTERLAB STUDY 01 SS

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.00 BASIC ACCEPTABLE ERROR= 3.00 CONCENTRATION ERROR INCREMENT= .0500
LABORATORIES YET TO REPORT: W0336,W0382,W0011,W0233
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	SS1		SS2		SS3		SS4		SS5		SB1	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0482	20.	40.50	11.	31.50	29.	31.50	20.	35.50	<1.	.00	52. H	65.50
W0485	20.	40.50	11.	31.50	34.	67.50	18.	18.50	<1.	.00	50.	61.00
W0489	19.6	31.00	11.2	38.00	28.6	27.00	19.8	29.00	.0	18.50	46.	39.00
W0493	16. L	9.50	9.	13.00	20. EL	2.00	18.	18.50	<2.	.00	44.	22.50
W0497	19.	25.50	11.	31.50	27.	14.00	22.	56.50	<1.	.00	47.	46.00
W0498	16. L	9.50	6. VL	5.00	25. L	6.00	15. L	6.50	.0	18.50	44.	22.50
W0506	20.	40.50	11.	31.50	30.	38.00	19.	26.00	<1.	.00	47.	46.00
W0511	21.	55.50	12.	48.00	32.	59.00	20.	35.50	.0	18.50	48.	53.00
W0514	21.	55.50	13.	59.00	32.	59.00	22.	56.50	.0	18.50	48.	53.00
W0516	17.	15.00	9.	13.00	27.	14.00	18.	18.50	2.	43.00	46.	39.00
W0524	20.	40.50	14.3	64.50	30.5	42.50	13.1 VL	2.00	2.	43.00	45.	30.00
W0526	16.4	12.00	12.9	56.00	28.4	26.00	23.2	63.00	.0	18.50	54.7 VH	67.00
W0528	20.	40.50	12.	48.00	28.	21.50	18.	18.50	<2.	.00	45.	30.00
W0529	23.	64.00	13.	59.00	30.	38.00	21.	47.00	.0	18.50	50.	61.00
W0533	20.	40.50	12.	48.00	29.	31.50	16. L	10.50	.0	18.50	49.	58.50
W0535	20.6	50.00	12.	48.00	31.6	55.00	20.4	42.00	13.7	50.00	45.2	35.00
W0538	20.	40.50	14.3	64.50	30.5	42.50	17.	14.50	.0	18.50	48.	53.00
W0542	20.	40.50	12.	48.00	27.	14.00	20.	35.50	<1.	.00	40. L	12.00
W0551	13. VL	2.00	12.	48.00	29.	31.50	20.	35.50	<1.	.00	51.	63.50
W0552	19.	25.50	10.	20.50	30.	38.00	20.	35.50	.0	18.50	46.	39.00
W0999	19.2	30.00	8.4	8.00	27.4	17.00	16. L	10.50	.0	18.50	36. VL	5.50
MEDIAN CONC.	20.000		11.000		30.000		20.000		.000		46.000	

PARAMETER: 00100 SUSPENDED SOLIDS MG/L

MISA INTERLAB STUDY 01 SS

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.00
BASIC ACCEPTABLE ERROR= 3.00 CONCENTRATION ERROR INCREMENT= .0500
LABORATORIES YET TO REPORT: W0336,W0382,W0011,W0233
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	SB2		SB3		SB4	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0009	40.	43.00	58.	31.00	48.	50.00
W0023	36.	15.00	54.	13.50	42.	16.00
W0028	38.6	31.00	44.4 EL	4.00	58. EH	68.00
W0042	42.	56.50	62.	56.00	50.	58.50
W0072	42.	56.50	61.	50.00	50.	58.50
W0127	36.	15.00	55.	17.50	43.	20.00
W0147	36.	15.00	65. H	64.00	47.	43.50
W0148	40.	43.00	60.	41.00	44.	25.00
W0149	41.	49.50	60.	41.00	47.	43.50
W0179	34. L	7.50	56.5	22.00	44.	25.00
W0198	35.	9.00	57.	25.50	44.	25.00
W0211	36.	15.00	57.	25.50	42.	16.00
W0238	42.	56.50	62.	56.00	50.	58.50
W0239	42.	56.50	59.	36.00	39. L	7.50
W0243	39.	35.50	56.	20.50	40. L	9.50
W0247	30. VL	3.00	50. VL	7.00	30. EL	1.00
W0248	41.	49.50	64.	61.00	51.	62.50
W0255	40.	43.00	56.	20.50	46.	37.00
W0266	39.	35.50	61.	50.00	45.	31.00
W0305	38.	27.00	59.	36.00	46.	37.00
W0335	28. EL	2.00	58.	31.00	44.	25.00
W0337	50.8 EH	67.00	64.8 H	62.00	54. VH	64.50
W0364	36.	15.00	55.	17.50	43.	20.00
W0370	36.	15.00	60.	41.00	46.	37.00
W0377	38.	27.00	82. EH	70.00	59. EH	69.00
W0380	33.6 L	6.00	38.4 EL	1.00	50.4	61.00
W0390	41.4	53.00	61.2	54.00	48.0	50.00
W0404	32. L	4.50	50. VL	7.00	37. VL	4.50
W0417	40.	43.00	60.	41.00	42.	16.00
W0418	41.	49.50	65. H	64.00	48.	50.00
W0427	48. VH	64.50	73. EH	67.00	54. VH	64.50
W0428	34. L	7.50	52. L	10.00	41.	12.00
W0429	48. VH	64.50	58.	31.00	43.	20.00
W0430	36.	15.00	55.	17.50	40. L	9.50
W0431	40.	43.00	54.	13.50	57. EH	67.00
W0433	36.	15.00	54.	13.50	41.	12.00
W0439	43.	61.00	41. EL	2.00	38. VL	6.00
W0441	38.	27.00	50. VL	7.00	45.	31.00
W0447	41.	49.50	65. H	64.00	35. EL	2.00
W0448	39.	35.50	58.	31.00	44.	25.00
W0456	17. EL	1.00	44. EL	3.00	37. VL	4.50
W0460	42.	56.50	60.	41.00	46.	37.00
W0462	42.	56.50	98. EH	71.00	56. VH	66.00
W0463	37.	22.00	54.	13.50	44.	25.00
W0464	36.	15.00	55.	17.50	44.	25.00
W0468	39.	35.50	53. L	11.00	49.	54.50
W0471	42.25	60.00	62.23	58.00	49.64	56.00
W0476	36.	15.00	58.	31.00	39. L	7.50
W0477	39.	35.50	60.	41.00	47.	43.50
W0480	41.	49.50	61.	50.00	47.	43.50
W0482	40.	43.00	57.	25.50	47.	43.50

PARAMETER: 00100 SUSPENDED SOLIDS MG/L

MISA INTERLAB STUDY 01 SS

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.00
BASIC ACCEPTABLE ERROR= 3.00 CONCENTRATION ERROR INCREMENT= .0500
LABORATORIES YET TO REPORT: W0336,W0382,W0011,W0233
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	SB2		SB3		SB4	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0485	41.	49.50	63.	59.50	51.	62.50
W0489	37.2	24.00	56.8	23.00	45.4	33.00
W0493	44. H	62.00	63.	59.50	48.	50.00
W0497	39.	35.50	61.	50.00	48.	50.00
W0498	37.	22.00	61.	50.00	41.	12.00
W0506	39.	35.50	60.	41.00	46.	37.00
W0511	40.	43.00	62.	56.00	49.	54.50
W0514	82. EH	71.00	61.	50.00	46.	37.00
W0516	38.	27.00	59.	36.00	47.	43.50
W0524	55. EH	70.00	75. EH	68.50	60. EH	70.00
W0526	51.8 EH	68.00	60.8	46.00	48.	50.00
W0528	37.	22.00	58.	31.00	45.	31.00
W0529	46. H	63.00	66. H	66.00	48.	50.00
W0533	38.	27.00	61.	50.00	50.	58.50
W0535	49. EH	66.00	60.6	45.00	35.8 EL	3.00
W0538	53. EH	69.00	75. EH	68.50	61. EH	71.00
W0542	36.	15.00	57.	25.50	42.	16.00
W0551	32. L	4.50	51. L	9.00	42.	16.00
W0552	39.	35.50	46. EL	5.00	46.	37.00
W0999	38.5	30.00	58.	31.00	44.5	29.00
MEDIAN CONC.	39.000		59.000		46.000	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING	
W0009	309.50	34.389	9	L EH		200-400	934AH 17
W0023	125.00	13.889	9	VLEL L L	BIASED LOW	500	#25GF 7
W0028	242.00	26.889	9	ELEH		500	OX-934AH 3
W0042	360.50	40.056	9			250	WH-934AH 16
W0072	497.50	55.278	9	H		92-250	WH-934AH 14
W0127	143.00	15.889	9			200	WH-934AH 53
W0147	363.50	40.389	9	H		200-250	GF 52
W0148	339.50	37.722	9			250-500	WH-934AH 77
W0149	452.50	50.278	9			400-526	WH-934AH 64
W0179	212.50	23.611	9	ELEH L		200	OX-934AH 6
W0198	154.00	17.111	9	VL VL		3-50	HACH 56
W0211	237.50	26.389	9			250-500	OX-934AH 31
W0238	478.50	53.167	9	H		100-200	GF/C 35
W0239	279.00	31.000	9	H L		250	WH-934AH 74
W0243	286.00	31.778	9	L		100-300	WH-GMF 20
W0247	81.00	9.000	9	ELVLVL ELVLVLEL	BIASED LOW	50	OX-934AH 70
W0248	493.50	54.833	9			100-200	WH-GF/C 21
W0255	308.00	34.222	9	VH H EL		100	SW-GMF 59
W0266	439.50	48.833	9	EH		250-500	WH-GMF 12
W0305	339.50	37.722	9			500	WH-GMF 62
W0335	158.00	17.556	9	L EL ELEL		50-100	OX-934AH 5
W0337	582.50	64.722	9	EHEHEHEH VHEHH VH	BIASED HIGH	250	WH-934AH 69
W0364	174.50	19.389	9			300-500	934AH 25
W0370	261.00	29.000	9			200	GMF 41
W0377	501.50	55.722	9	EHEHEHEH EL EHEH		100	WH-934AH 76
W0380	214.00	23.778	9	L EL		500	OXGF/FD 18
W0390	446.50	49.611	9			500	OX-934AH
W0404	132.00	14.667	9	VLEHVL VLL VLVL		100	WH-GF/A 73
W0417	340.00	42.500	8	H		200-250	WH-GF/C 48
W0418	332.50	41.563	8	H		400-500	WH-934AH 19
W0427	513.50	57.056	9	VHVHEHVH	BIASED HIGH	200	WH-934AH 61
W0428	145.50	18.188	8	L L		200	WH-934AH 78
W0429	292.50	36.563	8	H VH		100	GF/C 8
W0430	131.50	14.611	9	L VLVLVL L		100	GF 4
W0431	357.00	44.625	8	EH		300-500	WH-934AH 51
W0433	171.50	21.438	8	L		100-250	WH-934 26
W0439	241.50	30.188	8	L VL ELVL			
W0441	315.50	35.056	9	VL		100-200	WH-934AH 58
W0447	499.00	55.444	9	H VH VH EH H EL			
W0448	256.50	32.063	8			250	WH-934AH 32
W0456	81.50	10.188	8	L EL L VLELELVL	BIASED LOW	100	GEL-A/E 37
W0460	366.00	40.667	9			250	WH-934AH 28
W0462	533.00	59.222	9	EHEH VH EHVH	BIASED HIGH		
W0463	271.00	30.111	9			150-250	WH-934AH 2
W0464	122.00	15.250	8	VL L VL		250	WH-934AH 10
W0468	200.50	25.063	8	L L		100	WH-934AM 39
W0471	487.00	54.111	9			413-500	GF/C 50
W0476	123.00	15.375	8	L L L		100	GFC 57
W0477	337.00	37.444	9			100-300	OX-934AH 81
W0480	323.00	40.375	8	EL		250-460	GELMAN 23
W0482	316.50	39.563	8	H		100-200	WH-934AH 80
W0485	390.50	48.813	8			400-500	MF/GD 38
W0489	262.50	29.167	9			250-500	WH-GFIC 55
W0493	237.00	29.625	8	L EL H		100	WH-934AH 11
W0497	309.00	38.625	8			400-500	WH-934AH 36
W0498	152.00	16.889	9	L VLL L		100	WH-GMF 27
W0506	295.50	36.938	8				
W0511	423.00	47.000	9			ALL	WH-934AH 43
W0514	459.50	51.056	9	EH		250	WH-934AH 44
W0516	249.00	27.667	9			200	MP-AP40 13
W0524	431.00	47.889	9	VL EHEHEH		200	C-NITRATE 72
W0526	406.50	45.167	9	VHEH			WH-934AH 68
W0528	242.50	30.313	8				
W0529	466.50	51.833	9	H H		50-100	WH-GMF 79
W0533	343.00	38.111	9	L		455-555	WH-934AH 29

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING
W0535	394.00	43.778	9	EH EL
W0538	442.00	49.111	9	EHEHEH
W0542	206.50	25.813	8	L
W0551	210.00	26.250	8	VL L L
W0552	254.50	28.278	9	EL
W0999	179.50	19.944	9	L VL

OVERALL AVERAGE RANK IS 35.150

METHOD CODING

100	WH-934AH	49
200	WH-934AM	82
100-400	WH-934AH	46
250	GE-A/E	40
50-300	NU-P100	67
100-250	WH-934AH	24

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING
W0247	81.00	9.000	9	ELVLVLELVLVLEL
W0456	81.50	10.188	8	LELLVLELELVL
W0023	125.00	13.889	9	VLELLL
W0430	131.50	14.611	9	LVLVLVLL
W0404	132.00	14.667	9	VLEHVLVLLVLVL
W0464	122.00	15.250	8	VLLVL
W0476	123.00	15.375	8	LLL
W0127	143.00	15.889	9	
W0498	152.00	16.889	9	LVLLL
W0198	154.00	17.111	9	VLVL
W0335	158.00	17.556	9	LELELEL
W0428	145.50	18.188	8	LL
W0364	174.50	19.389	9	
W0999	179.50	19.944	9	LVL
W0433	171.50	21.438	8	L
W0179	212.50	23.611	9	ELEHL
W0380	214.00	23.778	9	LEL
W0468	200.50	25.063	8	LL
W0542	206.50	25.813	8	L
W0551	210.00	26.250	8	VLLL
W0211	237.50	26.389	9	
W0028	242.00	26.889	9	ELEH
W0516	249.00	27.667	9	
W0552	254.50	28.278	9	EL
W0370	261.00	29.000	9	
W0489	262.50	29.167	9	
W0493	237.00	29.625	8	LELH
W0463	271.00	30.111	9	
W0439	241.50	30.188	8	LVLELVL
W0528	242.50	30.313	8	
W0239	279.00	31.000	9	HL
W0243	286.00	31.778	9	L
W0448	256.50	32.063	8	
W0255	308.00	34.222	9	VHHEL
W0009	309.50	34.389	9	LEH
W0441	315.50	35.056	9	VL
W0429	292.50	36.563	8	HVH
W0506	295.50	36.938	8	
W0477	337.00	37.444	9	
W0148	339.50	37.722	9	
W0305	339.50	37.722	9	
W0533	343.00	38.111	9	L
W0497	309.00	38.625	8	
W0482	316.50	39.563	8	H
W0042	360.50	40.056	9	
W0480	323.00	40.375	8	EL
W0147	363.50	40.389	9	H
W0460	366.00	40.667	9	
W0418	332.50	41.563	8	H
W0417	340.00	42.500	8	H
W0535	394.00	43.778	9	EHEL
W0431	357.00	44.625	8	EH
W0526	406.50	45.167	9	VHEH
W0511	423.00	47.000	9	
W0524	431.00	47.889	9	VLEHEHEH
W0485	390.50	48.813	8	
W0266	439.50	48.833	9	EH
W0538	442.00	49.111	9	EHEHEH
W0390	446.50	49.611	9	
W0149	452.50	50.278	9	
W0514	459.50	51.056	9	EH
W0529	466.50	51.833	9	HH
W0238	478.50	53.167	9	H
W0471	487.00	54.111	9	
W0248	493.50	54.833	9	
W0072	497.50	55.278	9	H

		METHOD CODING	
BIASED LOW	50	OX-934AH	70
BIASED LOW	100	GEL-A/E	37
BIASED LOW	500	#25GF	7
	100	GF	4
	100	WH-GF/A	73
	250	WH-934AH	10
	100	GFC	57
	200	WH-934AH	53
	100	WH-GMF	27
	3-50	HACH	56
	50-100	OX-934AH	5
	200	WH-934AH	78
	300-500	934AH	25
	100-250	WH-934AH	24
	100-250	WH-934	26
	200	OX-934AH	6
	500	OXGF/FD	18
	100	WH-934AM	39
	100-400	WH-934AH	46
	250	GE-A/E	40
	250-500	OX-934AH	31
	500	OX-934AH	3
	200	MP-AP40	13
	50-300	NU-P100	67
	200	GMF	41
	250-500	WH-GFIC	55
	100	WH-934AH	11
	150-250	WH-934AH	2
	250	WH-934AH	74
	100-300	WH-GMF	20
	250	WH-934AH	32
	100	SW-GMF	59
	200-400	934AH	17
	100-200	WH-934AH	58
	100	GF/C	8
	100-300	OX-934AH	81
	250-500	WH-934AH	77
	500	WH-GMF	62
	455-555	WH-934AH	29
	400-500	WH-934AH	36
	100-200	WH-934AH	80
	250	WH-934AH	16
	250-460	GELMAN	23
	200-250	GF	52
	250	WH-934AH	28
	400-500	WH-934AH	19
	200-250	WH-GF/C	48
	100	WH-934AH	49
	300-500	WH-934AH	51
		WH-934AH	68
	ALL	WH-934AH	43
	200	C-NITRATE	72
	400-500	MF/GD	38
	250-500	WH-GMF	12
	200	WH-934AM	82
	500	OX-934AH	
	400-526	WH-934AH	64
	250	WH-934AH	44
	50-100	WH-GMF	79
	100-200	GF/C	35
	413-500	GF/C	50
	100-200	WH-GF/C	21
	92-250	WH-934AH	14

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING	
				HVHVHEHHEL		100	WH-934AH 76
W0447	499.00	55.444	9	EHEHEHEHELEHEH	BIASED HIGH	200	WH-934AH 61
W0377	501.50	55.722	9	VHVHEHVH	BIASED HIGH		
W0427	513.50	57.056	9	EHEHVHEHVH	BIASED HIGH	250	WH-934AH 69
W0462	533.00	59.222	9	EHEHEHEHVHEHHVH			
W0337	582.50	64.722					
OVERALL AVERAGE RANK IS		35.150					

PARAMETER: 00200 BIOCHEMICAL DEMAND MG/L

RESEARCH AND APPLICATIONS BRANCH
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MISA INTERLAB STUDY 02 BOD

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.00 BASIC ACCEPTABLE ERROR= 3.00 CONCENTRATION ERROR INCREMENT= .1500
LABORATORIES YET TO REPORT: W0336,W0382,W0233
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	BOD1		BOD2		BOD3		BOD4		SB1		SB2	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0042	10.	36.00	5.	20.50	16.	19.50	8.	18.00	50. EH	56.00	37. VH	51.00
W0072	6. L	7.00	3.	6.50	14.	13.00	6. L	6.50	25.	9.50	19.	8.00
W0147	5. L	4.00	2. L	3.00	14.	13.00	6. L	6.50	23. L	5.50	20.	10.50
W0148	6. L	7.00	4.	12.50	13. L	9.50	7.	12.00	19. VL	3.00	17. L	5.00
W0149	6. L	7.00	3.	6.50	11. L	5.50	5. L	3.50	25.	9.50	16. L	3.50
W0211	10.	36.00	7.	48.50	20.	40.50	11.	45.50	39. H	52.00	29.	43.00
W0238	10.	36.00	7.	48.50	18.	29.00	10.	32.50	30.	26.00	23.	18.00
W0239	12.	51.00	8.	52.00	24. H	51.00	11.	45.50	42. VH	54.00	31.	47.00
W0243	11.	46.00	12. EH	54.00	20.	40.50	11.	45.50	40. H	53.00	30.	45.00
W0248	9.	23.50	6.	36.50	17.	24.00	11.	45.50	27.	17.50	19.	8.00
W0255	250. EH	57.00	40. EH	55.00	210. EH	57.00	210. EH	57.00	10. EL	1.00	60. EH	57.00
W0335	8.	15.50	3.	6.50	8. EL	2.50	4. VL	2.00	35.	38.00	25.	26.50
W0337	9.	23.50	5.	20.50	19.	33.50	9.	25.00	26.	13.50	22.	15.00
W0364	10.	36.00	5.	20.50	18.	29.00	9.	25.00	32.	31.50	23.	18.00
W0404	9.	23.50	6.	36.50	12. L	7.50	9.	25.00	23. L	5.50	40. EH	53.00
W0417	9.	23.50	6.	36.50	20.	40.50	8.	18.00	33.	33.50	27.	35.50
W0418	7.	11.00	<5.	.00	11. L	5.50	7.	12.00	27.	17.50	15. VL	2.00
W0427	7.2	13.00	3.4	10.00	12.0 L	7.50	7.2	14.00	24.6	7.00	18.9 L	6.00
W0428	4. VL	2.00	<2.	.00	14.	13.00	5. L	3.50	32.	31.50	23.	18.00
W0429	12.	51.00	11. VH	53.00	25. H	53.50	18. EH	55.00	36.	43.00	34. H	50.00
W0430	8.7	19.00	5.4	29.00	17.5	27.00	10.	32.50	31.2	30.00	26.	31.50
W0431	10.	36.00	6.	36.50	20.	40.50	8.	18.00	35.	38.00	26.	31.50
W0433	7.	11.00	5.	20.50	16.	19.50	8.	18.00	35.	38.00	24.	22.00
W0439	25. EH	56.00	3.8	11.00	31. EH	56.00	6.4	9.00	27.	17.50	23.	18.00
W0441	9.	23.50	5.	20.50	18.	29.00	9.	25.00	30.	26.00	20.	10.50
W0447	9.	23.50	5.	20.50	19.	33.50	8.	18.00	36.	43.00	25.	26.50
W0456	5. L	4.00	1. L	1.00	6. EL	1.00	1. EL	1.00	30.	26.00	16. L	3.50
W0460	8.	15.50	5.	20.50	16.	19.50	8.	18.00	26.	13.50	19.	8.00
W0462	10.	36.00	6.	36.50	20.	40.50	10.	32.50	30.	26.00	25.	26.50
W0463	10.	36.00	5.	20.50	22.	48.50	10.	32.50	37.	47.00	29.	43.00
W0464	7.	11.00	3.	6.50	13. L	9.50	6. L	6.50	25.	9.50	21.	13.00
W0468	8.32	18.00	5.32	28.00	21.64	47.00	12.21	54.00	21.4 L	4.00	55.22 EH	56.00
W0471	6.12 L	9.00	3.38	9.00	8.67 VL	4.00	6.95	10.00	17.49 VL	2.00	7.57 EL	1.00
W0476	10.	36.00	6.	36.50	23. H	50.00	11.	45.50	38. H	50.00	28.	39.50
W0477	9.	23.50	6.	36.50	17.	24.00	9.	25.00	37.	47.00	33. H	49.00
W0480	11.	46.00	6.	36.50	20.	40.50	11.	45.50	29.	22.00	24.	22.00
W0482	8.	15.50	5.	20.50	17.	24.00	10.	32.50	29.	22.00	26.	31.50
W0485	9.	23.50	6.	36.50	17.	24.00	12.	52.50	29.	22.00	39. EH	52.00
W0489	16. VH	53.50	5.8	30.00	15.7	17.00	10.7	38.00	57.6 EH	57.00	48.5 EH	55.00
W0493	10.	36.00	5.	20.50	17.	24.00	10.	32.50	31.	29.00	26.	31.50
W0497	10.	36.00	5.	20.50	19.	33.50	11.	45.50	38. H	50.00	32. H	48.00
W0498	10.	36.00	7.	48.50	19.	33.50	10.	32.50	28.	20.00	27.	35.50
W0506	10.	36.00	5.	20.50	19.	33.50	11.	45.50	30.	26.00	25.	26.50
W0511	10.	36.00	4.	12.50	14.	13.00	8.	18.00	33.	33.50	23.	18.00
W0514	5. L	4.00	2. L	3.00	16.	19.50	7.	12.00	27.	17.50	21.	13.00
W0516	10.	36.00	5.	20.50	19.	33.50	10.	32.50	36.	43.00	25.	26.50
W0524	12.	51.00	7.	48.50	20.	40.50	11.	45.50	36.	43.00	28.	39.50
W0526	9.5	28.00	6.9	45.00	15.6	16.00	10.2	37.00	34.5	35.00	30.5	46.00
W0528	2. EL	1.00	2. L	3.00	8. EL	2.50	9.	25.00	26.	13.50	21.	13.00
W0529	18. EH	55.00	6.8	43.50	24.8 H	52.00	22.5 EH	56.00	49.5 EH	55.00	46.5 EH	54.00
W0533	8.	15.50	5.	20.50	14.	13.00	9.	25.00	25.	9.50	25.	26.50
W0535	16. VH	53.50	7.	48.50	26. VH	55.00	6. L	6.50	26.	13.50	24.	22.00

PARAMETER: 00200 BIOCHEMICAL DEMAND MG/L

RESEARCH AND APPLICATIONS BRANCH
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MISA INTERLAB STUDY 02 BOD

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.00 BASIC ACCEPTABLE ERROR= 3.00 CONCENTRATION ERROR INCREMENT= .1500
LABORATORIES YET TO REPORT: W0336,W0382,W0233
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	BOD1		BOD2		BOD3		BOD4		SB1		SB2	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0538	11.	46.00	6.	36.50	22.	48.50	11.	45.50	38. H	50.00	27.	35.50
W0542	11.	46.00	6.	36.50	21.	46.00	11.	45.50	35.	38.00	28.	39.50
W0551	11.	46.00	7.	48.50	25. H	53.50	12.	52.50	37.	47.00	29.	43.00
W0552	10.	36.00	6.	36.50	20.	40.50	11.	45.50	35.	38.00	27.	35.50
W0999	11.3	49.00	6.8	43.50	20.3	45.00	10.9	39.00	36.	43.00	28.	39.50
MEDIAN CONC.	10.000		5.320		18.000		10.000		31.000		25.000	

PARAMETER: 00200 BIOCHEMICAL DEMAND MG/L

MISA INTERLAB STUDY 02 BOD

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.00
BASIC ACCEPTABLE ERROR= 3.00 CONCENTRATION ERROR INCREMENT= .1500
LABORATORIES YET TO REPORT: W0336,W0382,W0233
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	SB3		SB4	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0042	56. EH	54.00	50. EH	53.00
W0072	27.	10.00	24. L	4.50
W0147	27.	10.00	24. L	4.50
W0148	24. L	6.00	22. L	2.00
W0149	27.	10.00	25.	7.00
W0211	41.	42.00	37.	42.50
W0238	31.	18.00	31.	26.50
W0239	53. EH	53.00	45. VH	51.00
W0243	36.	34.00	40. H	48.00
W0248	28.	13.00	30.	19.50
W0255		.00		.00
W0335	.0 EL	1.00	40. H	48.00
W0337	31.	18.00	25.	7.00
W0364	28.	13.00	32.	32.00
W0404	48. VH	51.50	52. EH	54.00
W0417	41.	42.00	30.	19.50
W0418	24. L	6.00	25.	7.00
W0427	31.5	20.00	22.8 L	3.00
W0428	35.	31.00	31.	26.50
W0429	57. EH	55.00	42. VH	50.00
W0430	37.	37.00	31.8	29.00
W0431	40.	39.50	34.	36.50
W0433	37.	37.00	37.	42.50
W0439	28.	13.00	31.	26.50
W0441	34.	27.50	29.	14.00
W0447	24. L	6.00	30.	19.50
W0456	30.	16.00	30.	19.50
W0460	29.	15.00	27.	10.50
W0462	40.	39.50	32.	32.00
W0463	44. H	49.50	37.	42.50
W0464	32.	21.50	27.	10.50
W0468	23.3 L	4.00	28.82	13.00
W0471	20.28 VL	2.00	17.67 VL	1.00
W0476	44. H	49.50	36.	39.50
W0477	37.	37.00	32.	32.00
W0480	36.	34.00	30.	19.50
W0482	34.	27.50	30.	19.50
W0485	32.	21.50	47. EH	52.00
W0489	74. EH	56.00	100. EH	56.00
W0493	35.	31.00	32.	32.00
W0497	42. H	46.00	37.	42.50
W0498	34.	27.50	30.	19.50
W0506	35.	31.00	31.	26.50
W0511	34.	27.50	30.	19.50
W0514	33.	24.00	62. EH	55.00
W0516	22. VL	3.00	30.	19.50
W0524	42. H	46.00	35.	38.00
W0526	33.	24.00	32.5	35.00

PARAMETER: 00200 BIOCHEMICAL DEMAND MG/L

MISA INTERLAB STUDY 02 BOD

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= 5.00
BASIC ACCEPTABLE ERROR= 3.00 CONCENTRATION ERROR INCREMENT= .1500
LABORATORIES YET TO REPORT: W0336,W0382,W0233
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	SB3		SB4	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0528	33.	24.00	26.	9.00
W0529	25.5 L	8.00	39. H	45.50
W0533	36.	34.00	28.	12.00
W0535	31.	18.00	30.	19.50
W0538	42. H	46.00	34.	36.50
W0542	42. H	46.00	36.	39.50
W0551	48. VH	51.50	32.	32.00
W0552	41.	42.00	39. H	45.50
W0999	42. H	46.00	40. H	48.00
MEDIAN CONC.	34.000		31.400	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		BOTTLE NO.
W0042	308.00	38.500	8	EHVHEHEH		16
W0072	65.00	8.125	8	L L L		14
W0147	57.00	7.125	8	L L L L L	BIASED LOW	52
W0148	57.00	7.125	8	L L VLL L L	BIASED LOW	77
W0149	52.50	6.563	8	L L L L	BIASED LOW	64
W0211	350.00	43.750	8	H		31
W0238	234.50	29.313	8			35
W0239	404.50	50.563	8	H VH EHVH	BIASED HIGH	74
W0243	366.00	45.750	8	EH H H		20
W0248	187.50	23.438	8			21
W0255	284.00	47.333	6	EHEHEHEHELEH		59
W0335	140.00	17.500	8	ELVL ELH		5
W0337	156.00	19.500	8			69
W0364	205.00	25.625	8			25
W0404	256.50	32.063	8	L L EHVHEH		73
W0417	249.00	31.125	8			48
W0418	61.00	8.714	7	L VLL		19
W0427	80.50	10.063	8	L L L	BIASED LOW	61
W0428	125.50	17.929	7	VL L	BIASED LOW	78
W0429	410.50	51.313	8	VHH EH H EHVH		8
W0430	235.00	29.375	8		BIASED HIGH	4
W0431	276.50	34.563	8			51
W0433	208.50	26.063	8			26
W0439	207.00	25.875	8	EH EH		54
W0441	176.00	22.000	8			58
W0447	190.50	23.813	8	L		34
W0456	72.00	9.000	8	L L ELEL L		37
W0460	120.50	15.063	8		BIASED LOW	28
W0462	269.50	33.688	8			42
W0463	319.50	39.938	8	H		2
W0464	88.00	11.000	8	L L		10
W0468	224.00	28.000	8	L EHL		39
W0471	38.00	4.750	8	L VL VLELVLVL		50
W0476	346.50	43.313	8	H H H	BIASED LOW	57
W0477	274.00	34.250	8	H		81
W0480	266.00	33.250	8			23
W0482	193.00	24.125	8			80
W0485	284.00	35.500	8	EH EH		38
W0489	362.50	45.313	8	VH EHEHEHEH		55
W0493	236.50	29.563	8			11
W0497	322.00	40.250	8	H H H		36
W0498	253.00	31.625	8			27
W0506	245.50	30.688	8			47
W0511	178.00	22.250	8			43
W0514	148.00	18.500	8	L L EH		44
W0516	214.50	26.813	8	VL		13
W0524	352.00	44.000	8	H		72
W0526	266.00	33.250	8			68
W0528	91.00	11.375	8	ELL EL		63
W0529	369.00	46.125	8	EH H EHEHEHL H		79
W0533	156.00	19.500	8			29
W0535	236.50	29.563	8	VH VHL		49
W0538	344.50	43.063	8	H H		82
W0542	337.00	42.125	8	H		46
W0551	374.00	46.750	8	H VH		40
W0552	319.50	39.938	8	H		67
W0999	353.00	44.125	8	H H		24

OVERALL AVERAGE RANK IS 28.754

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED METHOD CODING	SUMMARY OF FLAGGING		BOTTLE NO.
WO471	38.00	4.750	8	LVLVLELVLVL	BIASED LOW	50
WO149	52.50	6.563	8	LLLL	BIASED LOW	64
WO147	57.00	7.125	8	LLLLL	BIASED LOW	52
WO148	57.00	7.125	8	LLVLLLL	BIASED LOW	77
WO072	65.00	8.125	8	LLL	BIASED LOW	14
WO418	61.00	8.714	7	LVLL	BIASED LOW	19
WO456	72.00	9.000	8	LLELELL	BIASED LOW	37
WO427	80.50	10.063	8	LLL	BIASED LOW	61
WO464	88.00	11.000	8	LL		10
WO528	91.00	11.375	8	ELLEL		63
WO460	120.50	15.063	8			28
WO335	140.00	17.500	8	ELVLELH		5
WO428	125.50	17.929	7	VLL		78
WO514	148.00	18.500	8	LLEH		44
WO337	156.00	19.500	8			69
WO533	156.00	19.500	8			29
WO441	176.00	22.000	8			58
WO511	178.00	22.250	8			43
WO248	187.50	23.438	8			21
WO447	190.50	23.813	8	L		34
WO482	193.00	24.125	8			80
WO364	205.00	25.625	8			25
WO439	207.00	25.875	8	EHEH		54
WO433	208.50	26.063	8			26
WO516	214.50	26.813	8	VL		13
WO468	224.00	28.000	8	LEHL		39
WO238	234.50	29.313	8			35
WO430	235.00	29.375	8			4
WO493	236.50	29.563	8			11
WO535	236.50	29.563	8	VHVHL		49
WO506	245.50	30.688	8			47
WO417	249.00	31.125	8			48
WO498	253.00	31.625	8			27
WO404	256.50	32.063	8	LLEHVHEH		73
WO526	266.00	33.250	8			68
WO480	266.00	33.250	8			23
WO462	269.50	33.688	8			42
WO477	274.00	34.250	8	H		81
WO431	276.50	34.563	8			51
WO485	284.00	35.500	8	EHEH		38
WO042	308.00	38.500	8	EHVHEHEH		16
WO463	319.50	39.938	8	H		2
WO552	319.50	39.938	8	H		67
WO497	322.00	40.250	8	HHH		36
WO542	337.00	42.125	8	H		46
WO538	344.50	43.063	8	HH		82
WO476	346.50	43.313	8	HHH		57
WO211	350.00	43.750	8	H		31
WO524	352.00	44.000	8	H		72
WO999	353.00	44.125	8	HH		24
WO489	362.50	45.313	8	VHEHEHEHEH		55
WO243	366.00	45.750	8	EHHH		20
WO529	369.00	46.125	8	EHHEHEHEHLH		79
WO551	374.00	46.750	8	HVH		40
WO255	284.00	47.333	6	EHEHEHEHELEH		59
WO239	404.50	50.563	8	HVHEHVH	BIASED HIGH	74
WO429	410.50	51.313	8	VHHEHHEHVH	BIASED HIGH	8
OVERALL AVERAGE RANK IS		28.754				

PARAMETER: 01092 PH

PH UNITS

RESEARCH AND APPLICATIONS BRANCH
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MISA INTERLAB STUDY 03 pH

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .00 BASIC ACCEPTABLE ERROR= .25 CONCENTRATION ERROR INCREMENT= .0000
LABORATORIES YET TO REPORT: W0353 W0268 W0534 W0045 W0311 W0185 W0142
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	PH1		PH2		PH3		PH4		PH5		PH6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0009	7.46	48.00	5.15	66.00	8.46	59.00	7.80	46.00	8.95	44.00	9.00	21.50
W0010	7.25	4.00	5.0	17.00	8.15	22.50	7.55	24.00	8.65 L	12.00	9.15	32.00
W0017	7.51	68.00	5.00	17.00	7.80 VL	5.00	7.50	21.00	8.48 VL	6.00	8.94 L	16.00
W0021	7.4	21.50	5.1	57.50	8.4	49.50	8.0 H	61.00	9.0	54.50	9.5 H	62.00
W0023	7.30	7.50	5.05	40.00	8.35	41.50	7.45	14.00	8.95	44.00	9.07	28.50
W0028	7.45	41.00	5.9 EH	77.00	8.5	66.00	7.61	29.50	8.95	44.00	9.45	59.00
W0042	7.30	7.50	5.00	17.00	8.10	18.50	7.70	39.50	8.72	18.00	9.50 H	62.00
W0072	7.45	41.00	5.00	17.00	8.30	38.00	7.90	51.50	8.90	36.00	9.40	51.50
W0127	7.37	14.00	5.00	17.00	7.68 EL	2.00	7.48	17.00	8.84	30.00	9.02	26.50
W0147	7.46	48.00	4.95	4.00	8.58 H	75.00	8.09 VH	72.00	9.15	76.00	9.75 EH	76.00
W0148	7.36	11.00	4.98	7.50	8.44	55.50	7.61	29.50	9.07	69.00	9.42	57.00
W0149	7.47	53.50	5.04	35.00	8.51	70.00	7.50	21.00	8.99	50.00	9.37	49.00
W0179	7.5	63.50	5.1	57.50	8.44	55.50	7.4 L	11.00	8.9	36.00	9.3	46.50
W0190	7.43	32.50	5.10	57.50	8.45	57.50	7.68	34.50	8.97	48.00	9.20	38.00
W0198	7.64	75.00	5.25	71.50	8.57 H	73.50	7.89	50.00	9.11	74.00	9.70 VH	75.00
W0211	7.47	53.50	5.08	52.00	7.92 VL	9.00	7.57	26.50	8.64 L	11.00	9.02	26.50
W0233	7.4	21.50	5.0	17.00	7.9 VL	8.00	7.3 VL	7.50	8.4 EL	3.00	8.9 L	14.50
W0238	7.45	41.00	5.10	57.50	8.50	66.00	7.75	43.50	9.0	54.50	9.50 H	62.00
W0239	6.73 EL	1.00	4.87	1.00	8.5	66.00	7.69	36.50	8.71	17.00	9.18	34.00
W0247	7.50	63.50	5.15	66.00	8.40	49.50	8.00 H	61.00	9.00	54.50	9.00	21.50
W0248	7.75 H	77.00	5.25	71.50	8.20	26.50	7.10 EL	1.50	9.00	54.50	9.20	38.00
W0255	7.45	41.00	5.00	17.00	8.07	15.00	7.45	14.00	8.73	19.00	8.80 VL	8.00
W0266	7.36	11.00	5.15	66.00	8.02 L	11.50	7.49	18.50	8.46 VL	4.50	8.86 L	10.50
W0305	7.36	11.00	5.15	66.00	8.02 L	11.50	7.49	18.50	8.46 VL	4.50	8.86 L	10.50
W0335	7.5	63.50	5.1	57.50	7.8 VL	5.00	7.4 L	11.00	8.6 L	8.00	8.9 L	14.50
W0336	7.67	76.00	5.17	69.00	8.52	71.00	7.65	33.00	8.98	49.00	9.54 H	66.00
W0337	7.42	28.00	5.06	45.50	8.13	20.00	7.68	34.50	8.79	22.50	9.30	46.50
W0364	7.50	63.50	5.1	57.50	8.1	18.50	7.7	39.50	8.8	26.00	7.9 EL	1.00
W0370	7.4	21.50	5.0	17.00	8.6 H	76.00	7.5	21.00	8.8	26.00	9.0	21.50
W0377	7.4	21.50	5.2	70.00	8.4	49.50	8.0 H	61.00	8.9	36.00	9.2	38.00
W0380	7.52	69.00	5.28	73.00	8.31	40.00	8.18 VH	75.00	9.08	71.00	9.42	57.00
W0382	7.4	21.50	5.0	17.00	8.2	26.50	7.7	39.50	8.7	15.50	8.8 VL	8.00
W0389	7.45	41.00	5.08	52.00	8.37	45.50	7.80	46.00	9.00	54.50	9.58 VH	69.00
W0404	7.4	21.50	5.0	17.00	8.2	26.50	7.1 EL	1.50	9.0	54.50	9.0	21.50
W0417	7.40	21.50	4.90	2.00	8.14	21.00	7.52	23.00	8.80	26.00	9.16	33.00
W0418	7.47	53.50	5.05	40.00	8.54	72.00	8.00 H	61.00	9.09	72.00	9.60 VH	71.00
W0427	7.29	6.00	4.99	9.50	8.03 L	13.00	7.57	26.50	8.70	15.50	9.24	41.00
W0428	7.5	63.50	5.1	57.50	8.5	66.00	8.1 VH	73.00	9.1	73.00	9.6 VH	71.00
W0429	7.44	36.00	4.99	9.50	8.24	31.00	7.45	14.00	8.91	39.50	8.26 EL	2.00
W0431	7.24	3.00	5.04	35.00	8.09	16.50	7.47	16.00	8.68	13.00	8.73 VL	5.00
W0433	7.44	36.00	5.01	26.00	8.06	14.00	7.70	39.50	8.76	21.00	8.89 L	13.00
W0439	7.17 L	2.00	5.12	62.50	8.21	29.50	7.90	51.50	8.74	20.00	9.29	44.00
W0441	7.56	72.00	5.03	31.00	8.82 EH	77.00	8.32 EH	77.00	9.50 EH	77.00	10.17 EH	77.00
W0447	7.5	63.50	5.0	17.00	8.2	26.50	7.8	46.00	8.8	26.00	9.3	46.50
W0448	7.44	36.00	5.04	35.00	8.38	47.00	7.60	28.00	8.96	46.50	9.19	35.00
W0456	7.63	74.00	5.12	62.50	8.28	35.50	7.85	48.00	9.07	69.00	9.46 H	60.00
W0460	7.46	48.00	5.01	26.00	8.36	43.50	8.02 H	67.00	9.00	54.50	9.52 H	64.50
W0462	7.48	58.50	5.02	29.00	8.50	66.00	8.01 H	65.00	9.07	69.00	9.62 VH	73.00
W0463	7.43	32.50	5.05	40.00	8.48	62.50	8.06 H	70.00	9.06	66.50	9.52 H	64.50
W0464	7.4	21.50	5.0	17.00	8.3	38.00	8.0 H	61.00	9.0	54.50	9.4	51.50
W0468	7.54	70.50	5.06	45.50	8.57 H	73.50	8.28 EH	76.00	9.12	75.00	9.00	21.50
W0469	7.474	57.00	5.067	48.00	8.505	69.00	8.088 VH	71.00	9.048	64.00	9.401	53.00

PARAMETER: 01092 PH

PH UNITS

RESEARCH AND APPLICATIONS BRANCH
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MISA INTERLAB STUDY 03 pH

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .00 BASIC ACCEPTABLE ERROR= .25 CONCENTRATION ERROR INCREMENT= .0000
LABORATORIES YET TO REPORT: W0353 W0268 W0534 W0045 W0311 W0185 W0142
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	PH1		PH2		PH3		PH4		PH5		PH6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0471	7.26	5.00	5.60 EH	76.00	7.77 EL	3.00	7.35 L	9.00	8.25 EL	1.50	8.60 EL	4.00
W0476	7.45	41.00	5.06	45.50	8.26	34.00	7.92	54.00	8.93	41.50	9.07	28.50
W0477	7.45	41.00	5.01	26.00	8.21	29.50	8.00 H	61.00	8.9	36.00	9.3	46.50
W0480	7.42	28.00	5.04	35.00	8.36	43.50	7.95	56.00	8.89	33.00	9.41	54.50
W0482	7.42	28.00	5.08	52.00	8.09	16.50	7.56	25.00	8.69	14.00	8.78 VL	6.00
W0489	7.43	32.50	5.03	31.00	8.28	35.50	7.69	36.50	8.80	26.00	9.41	54.50
W0493	7.47	53.50	5.03	31.00	8.48	62.50	8.02 H	67.00	9.04	63.00	9.56 H	67.00
W0497	7.43	32.50	5.05	40.00	8.43	53.00	7.63	32.00	8.96	46.50	9.26	42.00
W0498	7.37	14.00	4.97	5.50	7.80 VL	5.00	7.30 VL	7.50	8.61 L	9.50	8.95	17.00
W0506	7.60	73.00	5.40 H	74.00	8.25	32.50	8.00 H	61.00	8.90	36.00	9.00	21.50
W0511	7.50	63.50	5.15	66.00	8.25	32.50	7.75	43.50	8.85	31.00	9.20	38.00

PARAMETER: 01092 PH PH UNITS

MISA INTERLAB STUDY 03 pH

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .00 BASIC ACCEPTABLE ERROR= .25 CONCENTRATION ERROR INCREMENT= .0000
LABORATORIES YET TO REPORT: W0353 W0268 W0534 W0045 W0311 W0185 W0142
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	PH1		PH2		PH3		PH4		PH5		PH6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0514	7.42	28.00	5.06	45.50	8.35	41.50	7.74	42.00	9.01	60.50	9.20	38.00
W0515	7.54	70.50	4.94	3.00	8.16	24.00	7.24 VL	4.00	8.81	29.00	9.13	31.00
W0516	7.48	58.50	5.10	57.50	8.42	52.00	8.05 H	69.00	8.93	41.50	9.01	25.00
W0524	7.46	48.00	5.01	26.00	7.95 L	10.00	7.40 L	11.00	8.61 L	9.50	8.87 L	12.00
W0526	7.42	28.00	5.04	35.00	8.37	45.50	7.91	53.00	8.91	39.50	9.08	30.00
W0528	7.47	53.50	5.07	49.50	8.45	57.50	7.98 H	57.00	9.05	65.00	9.60 VH	71.00
W0529	7.46	48.00	5.07	49.50	8.47	60.50	8.02 H	67.00	9.01	60.50	9.57 H	68.00
W0533	7.31	9.00	5.49 VH	75.00	7.65 EL	1.00	7.11 EL	3.00	8.25 EL	1.50	8.46 EL	3.00
W0535	7.39	17.00	5.00	17.00	8.30	38.00	7.93	55.00	8.88	32.00	9.38	50.00
W0538	7.38	16.00	5.01	26.00	7.86 VL	7.00	7.27 VL	6.00	8.55 L	7.00	8.80 VL	8.00
W0542	7.458	45.00	5.051	43.00	8.431	54.00	8.154 VH	74.00	9.004	59.00	9.420	57.00
W0551	7.47	53.50	5.05	40.00	8.47	60.50	7.62	31.00	9.03	62.00	9.28	43.00
W0552	7.50	63.50	4.98	7.50	8.40	49.50	7.86	49.00	9.06	66.50	9.63 VH	74.00
W0999	7.37	14.00	4.97	5.50	8.15	22.50	7.25 VL	5.00	8.79	22.50	8.99	18.00
MEDIAN CONC.	7.450		5.050		8.300		7.700		8.910		9.200	

PARAMETER: 01092 PH PH UNITS

MISA INTERLAB STUDY 03 pH

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .00
BASIC ACCEPTABLE ERROR= .25 CONCENTRATION ERROR INCREMENT= .0000
LABORATORIES YET TO REPORT: W0353 W0268 W0534 W0045 W0311 W0185 W0142
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	PH7		PH8	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0009	8.09	42.50	6.45	53.00
W0010	7.9	23.50	6.3	6.50
W0017	7.62 VL	9.00	6.28	4.50
W0021	8.1	45.00	6.4	24.50
W0023	7.80 L	16.00	6.28	4.50
W0028	8.25	66.00	6.6	73.50
W0042	8.00	31.00	6.40	24.50
W0072	8.25	66.00	6.45	53.00
W0127	8.04	34.00	6.38	14.00
W0147	8.17	54.50	6.41	30.00
W0148	7.87	20.00	6.39	18.00
W0149	8.40 H	76.50	6.48	61.50
W0179	8.0	31.00	6.5	65.00
W0190	8.07	41.00	6.45	53.00
W0198	8.25	66.00	6.57	70.00
W0211	7.80 L	16.00	6.44	44.50
W0233	7.2 EL	1.00	6.2	2.00
W0238	8.05	36.00	6.45	53.00
W0239	7.91	26.00	5.84 EL	1.00
W0247	8.20	57.00	6.60	73.50
W0248	7.90	23.50	6.60	73.50
W0255	7.77 L	14.00	6.39	18.00
W0266	8.06	39.00	6.44	44.50
W0305	8.06	39.00	6.44	44.50
W0335	7.6 VL	7.50	6.5	65.00
W0336	7.97	28.00	6.46	58.50
W0337	8.01	33.00	6.40	24.50
W0364	7.9	23.50	6.4	24.50
W0370	7.8 L	16.00	6.4	24.50
W0377	7.7 L	10.50	6.4	24.50
W0380	8.35 H	72.50	6.55	68.50
W0382	8.2	57.00	6.6	73.50
W0389	8.12	47.00	6.45	53.00
W0404	7.6 VL	7.50	6.3	6.50
W0417	7.57 VL	6.00	6.33	8.50
W0418	8.29	71.00	6.39	18.00
W0427	7.72 L	12.00	6.38	14.00
W0428	8.2	57.00	6.5	65.00
W0429	8.06	39.00	6.39	18.00
W0431	7.86	19.00	6.33	8.50
W0433	7.89	21.00	6.39	18.00
W0439	8.21	60.00	6.59	71.00
W0441	8.36 H	74.00	6.41	30.00
W0447	7.7 L	10.50	6.4	24.50
W0448	8.24	63.00	6.45	53.00
W0456	8.00	31.00	6.62	76.00
W0460	8.05	36.00	6.41	30.00
W0462	8.15	50.50	6.44	44.50
W0463	8.27	68.00	6.47	60.00
W0464	8.1	45.00	6.5	65.00
W0468	8.35 H	72.50	6.44	44.50
W0469	8.246	64.00	6.420	35.00
W0471	7.44 EL	3.00	6.55	68.50
W0476	8.10	45.00	6.45	53.00

PARAMETER: 01092 PH PH UNITS

MISA INTERLAB STUDY 03 pH

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .00
BASIC ACCEPTABLE ERROR= .25 CONCENTRATION ERROR INCREMENT= .0000
LABORATORIES YET TO REPORT: W0353 W0268 W0534 W0045 W0311 W0185 W0142
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	PH7		PH8	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0477	8.13	48.50	6.42	35.00
W0480	8.13	48.50	6.42	35.00
W0482	7.99	29.00	6.43	39.00
W0489	8.16	52.50	6.48	61.50
W0493	8.15	50.50	6.43	39.00
W0497	8.16	52.50	6.44	44.50
W0498	7.54 EL	5.00	6.35	11.00
W0506	8.40 H	76.50	6.80 H	77.00
W0511	7.75 L	13.00	6.45	53.00
W0514	8.28	69.00	6.40	24.50
W0515	7.48 EL	4.00	6.34	10.00
W0516	8.38 H	75.00	6.44	44.50
W0524	7.90	23.50	6.38	14.00
W0526	8.23	62.00	6.42	35.00
W0528	8.05	36.00	6.50	65.00
W0529	8.21	60.00	6.46	58.50
W0533	7.40 EL	2.00	6.45	53.00
W0535	8.09	42.50	6.37	12.00
W0538	7.84	18.00	6.27	3.00
W0542	8.286	70.00	6.417	32.00
W0551	8.17	54.50	6.44	44.50
W0552	8.21	60.00	6.42	35.00
W0999	7.93	27.00	6.43	39.00
MEDIAN CONC.	8.060		6.430	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
W0009	380.00	47.500	8			K
W0010	141.50	17.688	8	L		J
W0017	146.50	18.313	8	VL VLL VL		L
W0021	375.50	46.938	8	H H		L
W0023	196.00	24.500	8	L		L
W0028	456.00	57.000	8	EH		K
W0042	218.00	27.250	8	H		K
W0072	354.00	44.250	8			J
W0127	154.50	19.313	8	EL		L
W0147	435.50	54.438	8	H VH EH		K
W0148	267.50	33.438	8			L
W0149	416.50	52.063	8	H		L
W0179	366.00	45.750	8	L		L
W0190	362.00	45.250	8			J
W0198	555.00	69.375	8	H VH	BIASED HIGH	J
W0211	239.00	29.875	8	VL L L		L
W0233	74.50	9.313	8	VLVLELL EL	BIASED LOW	J
W0238	413.50	51.688	8	H		L
W0239	182.50	22.813	8	EL EL		L
W0247	446.50	55.813	8	H		L
W0248	366.00	45.750	8	H EL		L
W0255	146.00	18.250	8	VLL		L
W0266	205.50	25.688	8	L VLL		J
W0305	205.50	25.688	8	L VLL		J
W0335	232.00	29.000	8	VLL L L VL		J
W0336	450.50	56.313	8	H		L
W0337	254.50	31.813	8			K
W0364	254.00	31.750	8	EL		L
W0370	223.50	27.938	8	H L		J
W0377	311.00	38.875	8	H L		L
W0380	526.00	65.750	8	VH H	BIASED HIGH	J
W0382	258.50	32.313	8	VL		L
W0389	408.00	51.000	8	VH		L
W0404	156.50	19.563	8	EL VL		J
W0417	141.00	17.625	8	VL		L
W0418	458.50	57.313	8	H VH		L
W0427	137.50	17.188	8	L L		K
W0428	526.00	65.750	8	VH VH	BIASED HIGH	J
W0429	189.00	23.625	8	EL		K
W0431	116.00	14.500	8	VL		J
W0433	188.50	23.563	8	L		K
W0439	340.50	42.563	8	L		L
W0441	515.00	64.375	8	EHEHEHEHH	BIASED HIGH	K
W0447	260.50	32.563	8	L		L
W0448	343.50	42.938	8			J
W0456	456.00	57.000	8	H		K
W0460	369.50	46.188	8	H H		K
W0462	455.50	56.938	8	H VH		L
W0463	464.00	58.000	8	H H		L
W0464	353.50	44.188	8	H		K
W0468	479.00	59.875	8	H EH H		L
W0469	461.00	57.625	8	VH		J
W0471	170.00	21.250	8	EHELL ELELEL		L
W0476	342.50	42.813	8			K
W0477	323.50	40.438	8	H		J
W0480	333.50	41.688	8			L
W0482	209.50	26.188	8	VL		J
W0489	330.00	41.250	8			L
W0493	433.50	54.188	8	H H		J
W0497	343.00	42.875	8			K
W0498	74.50	9.313	8	VLVLL EL	BIASED LOW	J
W0506	451.50	56.438	8	H H H H		J
W0511	340.50	42.563	8	L		L
W0514	349.00	43.625	8			L
W0515	175.50	21.938	8	VL EL		J
W0516	423.00	52.875	8	H H		K

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
W0524	154.00	19.250	8	L L L L		K
W0526	328.00	41.000	8			K
W0528	454.50	56.813	8	H VH		J
W0529	472.00	59.000	8	H H		L
W0533	147.50	18.438	8	VHELELELELEL		J
W0535	263.50	32.938	8			J
W0538	91.00	11.375	8	VLVLL VL	BIASED LOW	K
W0542	434.00	54.250	8	VH		K
W0551	389.00	48.625	8			K
W0552	405.00	50.625	8	VH		L
W0999	153.50	19.188	8	VL		L
OVERALL AVERAGE RANK IS		39.000				

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
W0233	74.50	9.313	8	VLVLELLEL	BIASED LOW	J
W0498	74.50	9.313	8	VLVLLEL	BIASED LOW	J
W0538	91.00	11.375	8	VLVLLVL	BIASED LOW	K
W0431	116.00	14.500	8	VL		J
W0427	137.50	17.188	8	LL		K
W0417	141.00	17.625	8	VL		L
W0010	141.50	17.688	8	L		J
W0255	146.00	18.250	8	VLL		L
W0017	146.50	18.313	8	VLVLLVL		L
W0533	147.50	18.438	8	VHELELELELEL		J
W0999	153.50	19.188	8	VL		L
W0524	154.00	19.250	8	LLLL		K
W0127	154.50	19.313	8	EL		L
W0404	156.50	19.563	8	ELVL		J
W0471	170.00	21.250	8	EHELLELELEL		L
W0515	175.50	21.938	8	VLEL		J
W0239	182.50	22.813	8	ELEL		L
W0433	188.50	23.563	8	L		K
W0429	189.00	23.625	8	EL		K
W0023	196.00	24.500	8	L		L
W0305	205.50	25.688	8	LVLL		J
W0266	205.50	25.688	8	LVLL		J
W0482	209.50	26.188	8	VL		J
W0042	218.00	27.250	8	H		K
W0370	223.50	27.938	8	HL		J
W0335	232.00	29.000	8	VLLLLVL		J
W0211	239.00	29.875	8	VLLL		L
W0364	254.00	31.750	8	EL		L
W0337	254.50	31.813	8			K
W0382	258.50	32.313	8	VL		L
W0447	260.50	32.563	8	L		L
W0535	263.50	32.938	8			J
W0148	267.50	33.438	8			L
W0377	311.00	38.875	8	HL		L
W0477	323.50	40.438	8	H		J
W0526	328.00	41.000	8			K
W0489	330.00	41.250	8			L
W0480	333.50	41.688	8			L
W0511	340.50	42.563	8	L		L
W0439	340.50	42.563	8	L		K
W0476	342.50	42.813	8			K
W0497	343.00	42.875	8			J
W0448	343.50	42.938	8			L
W0514	349.00	43.625	8			K
W0464	353.50	44.188	8	H		J
W0072	354.00	44.250	8			J
W0190	362.00	45.250	8			L
W0179	366.00	45.750	8	L		L
W0248	366.00	45.750	8	HEL		K
W0460	369.50	46.188	8	HH		L
W0021	375.50	46.938	8	HH		K
W0009	380.00	47.500	8			K
W0551	389.00	48.625	8			L
W0552	405.00	50.625	8	VH		L
W0389	408.00	51.000	8	VH		L
W0238	413.50	51.688	8	H		L
W0149	416.50	52.063	8	H		K
W0516	423.00	52.875	8	HH		J
W0493	433.50	54.188	8	HH		K
W0542	434.00	54.250	8	VH		K
W0147	435.50	54.438	8	HVHEH		L
W0247	446.50	55.813	8	H		L
W0336	450.50	56.313	8	H		J
W0506	451.50	56.438	8	HHHH		J
W0528	454.50	56.813	8	HVH		L
W0462	455.50	56.938	8	HVH		

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
W0456	456.00	57.000	8	H		K
W0028	456.00	57.000	8	EH		K
W0418	458.50	57.313	8	HVH		L
W0469	461.00	57.625	8	VH		J
W0463	464.00	58.000	8	HH		L
W0529	472.00	59.000	8	HH		L
W0468	479.00	59.875	8	HEHH		L
W0441	515.00	64.375	8	EHEHEHEHH	BIASED HIGH	K
W0428	526.00	65.750	8	VHVH	BIASED HIGH	J
W0380	526.00	65.750	8	VHH	BIASED HIGH	J
W0198	555.00	69.375	8	HVH	BIASED HIGH	J

OVERALL AVERAGE RANK IS 39.000

PARAMETER: 15092 TOTAL PHOSPHORUS-STP MG P/L

RESEARCH AND APPLICATIONS BRANCH
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MISA INTERLAB STUDY 04 TOTAL P

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .15 BASIC ACCEPTABLE ERROR= .04 CONCENTRATION ERROR INCREMENT= .1800
LABORATORIES YET TO REPORT: W0353 W0268 W0534 W0045 W0311
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	TP1		TP2		TP3		TP4		TP5		TP6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0009	2.05	41.00	1.01	39.00	1.54	42.00	1.49	39.00	.00	6.50	.50	30.50
W0017	1.0 EL	11.00	.83	19.00	1.0 VL	15.00	1.0 VL	15.00	.0	6.50	.60	61.50
W0023	2.30	70.00	1.083	54.00	1.66	63.50	1.517	43.00	.830 EH	53.00	.54	44.00
W0028	2.15	50.50	1.05	49.00	1.55	45.00	1.55	52.50	.025	26.00	.55	47.50
W0042	2.00	35.00	1.05	49.00	1.49	33.50	1.51	41.50	.07	36.00	.64 H	67.00
W0072	2.16	53.50	1.02	42.00	1.55	45.00	1.54	50.50	<.02	.00	.54	44.00
W0127	.92 EL	10.00	.42 EL	7.00	.68 EL	7.00	.55 EL	5.00	.10 VH	42.50	.25 EL	9.00
W0147	1.80	20.50	.86	21.00	1.30	21.00	1.30	22.00	.08 H	39.50	.44	21.50
W0148	1.99	31.50	.97	28.00	1.49	33.50	1.43	28.50	.00	6.50	.51	34.00
W0149	2.21	63.00	1.06	51.00	1.85 H	75.00	1.52	44.00	.02	22.50	.57	54.50
W0179	.46 EL	4.00	.56 EL	10.00	.10 EL	1.00	.11 EL	1.00	.09 H	41.00	.02 EL	2.00
W0198	.9 EL	8.00	.8 L	16.00	.9 EL	10.50	.9 EL	13.00	.01	16.50	.5	30.50
W0211	2.07	42.00	1.00	35.50	1.50	37.00	1.47	35.00	.03	28.50	.50	30.50
W0233	2.00	35.00	1.00	35.50	1.50	37.00	1.42	27.00	.06	33.50	.56	51.00
W0238	2.12	47.50	1.19	67.50	1.77	70.00	1.74	69.00	.00	6.50	.61	64.50
W0239	2.25	67.50	1.0	35.50	1.5	37.00	1.58	55.50	.0	6.50	.53	41.00
W0243	2.01	38.50	1.15	63.00	1.57	47.00	1.64	61.00	.03	28.50	.65 H	68.50
W0247	1.80	20.50	.78 L	15.00	1.60	53.50	.70 EL	8.00	.00	6.50	.00 EL	1.00
W0248	2.25	67.50	.25 EL	1.00	.67 EL	6.00	.74 EL	9.00	.00	6.50	.36 VL	16.50
W0255	2.1	45.50	1.1	58.00	1.63	61.00	1.60	58.00	.06	33.50	.43	19.50
W0266	1.90	25.00	.99	31.50	1.44	28.50	1.44	30.50	.02	22.50	.46	24.50
W0305	1.90	25.00	.99	31.50	1.44	28.50	1.44	30.50	.02	22.50	.46	24.50
W0335	1.20 EL	15.00	.83	19.00	.97 VL	13.00	1.3	22.00	.0	6.50	.55	47.50
W0336	2.15	50.50	1.66 EH	74.00	1.8 H	74.00	1.72	68.00	.50 EH	52.00	1.07 EH	74.00
W0337	2.23	65.50	1.10	58.00	1.62	58.50	1.59	57.00	.0	6.50	.58	58.00
W0364	1.936	27.00	1.016	40.00	1.408	26.00	1.536	49.00	.104 VH	44.00	.327 VL	14.00
W0370	2.0	35.00	.77 L	14.00	1.71	69.00	1.13 L	17.00	.02	22.50	.52	37.50
W0377	.9 EL	8.00	.5 EL	9.00	1.3	21.00	1.3	22.00	.07	36.00	.3 EL	12.00
W0380	.9 EL	8.00	.666 VL	11.00	.766 EL	8.00	.966 VL	14.00	.16 EH	48.50	.172 EL	6.00
W0382	1.02 EL	12.00	.83	19.00	1.16 L	17.00	.79 EL	10.00	.02	22.50	.30 EL	12.00
W0389	.16 EL	1.00	.39 EL	6.00	.99 VL	14.00	.52 EL	4.00	.00	6.50	.29 EL	10.00
W0404	.76 EL	5.00	.34 EL	4.00	.50 EL	3.00	1.06 VL	16.00	.28 EH	51.00	.42	18.00
W0417	1.42 VL	16.00	.92	24.00	1.20 L	18.00	1.19 L	18.00	<.06	.00	.51	34.00
W0418	1.99	31.50	1.02	42.00	1.54	42.00	1.48	37.00	<.05	.00	.54	44.00
W0427	1.94	28.00	1.18	65.50	1.60	53.50	1.53	46.50	.03	28.50	.62	66.00
W0428	2.12	47.50	1.18	65.50	1.68	65.50	1.76 H	71.00	<.005	.00	.752 EH	72.00
W0429	1.96	29.00	1.00	35.50	1.46	30.00	1.45	33.00	.10 VH	42.50	.56	51.00
W0431	2.18	57.00	1.04	46.50	1.50	37.00	1.53	46.50	.04	31.00	.54	44.00
W0433	2.01	38.50	1.11	61.00	1.64	62.00	1.63	59.50	.07	36.00	.61	64.50
W0439	1.7	18.00	.38 EL	5.00	1.07 VL	16.00	.66 EL	7.00	5.1 EH	54.00	.04 EL	3.00
W0441	2.03	40.00	.97	28.00	1.47	31.00	1.48	37.00	.01	16.50	.49	27.50
W0447	1.87	23.00	1.11	61.00	1.30	21.00	1.63	59.50	.03	28.50	.52	37.50
W0448	2.19	58.50	1.04	46.50	1.58	48.50	1.58	55.50	<.1	.00	.56	51.00
W0456	2.48 H	73.50	1.07	52.00	1.79 H	72.50	1.82 H	74.00	<.01	.00	.56	51.00
W0460	2.17	56.00	1.00	35.50	1.54	42.00	1.54	50.50	<.01	.00	.52	37.50
W0462	2.23	65.50	1.03	44.50	1.59	50.50	1.55	52.50	<.001	.00	.576	56.00
W0463	2.16	53.50	1.02	42.00	1.62	58.50	1.67	65.00	<.05	.00	.526	40.00
W0464	.78 EL	6.00	.33 EL	3.00	.56 EL	5.00	.62 EL	6.00	<.01	.00	.23 EL	8.00
W0468	1.03 EL	13.00	.68 VL	12.00	.86 EL	9.00	.85 EL	12.00	<.001	.00	.54	44.00
W0469	2.283	69.00	1.095	56.00	1.688	68.00	1.661	63.00	.075 H	38.00	.603	63.00
W0471	.45 EL	2.50	.27 EL	2.00	.23 EL	2.00	.42 EL	3.00	<.01	.00	.16 EL	5.00
W0476	1.71	19.00	.812	17.00	1.26	19.00	1.23	19.50	<.01	.00	.452	23.00
W0477	2.20	61.00	1.163	64.00	1.683	67.00	1.663	64.00	.010	16.50	.590	60.00

PARAMETER: 15092 TOTAL PHOSPHORUS-STP MG P/L

RESEARCH AND APPLICATIONS BRANCH
NATIONAL WATER RESEARCH INSTITUTE
BURLINGTON ONTARIO

MISA INTERLAB STUDY 04 TOTAL P

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .15 BASIC ACCEPTABLE ERROR= .04 CONCENTRATION ERROR INCREMENT= .1800
LABORATORIES YET TO REPORT: W0353 W0268 W0534 W0045 W0311
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	TP1		TP2		TP3		TP4		TP5		TP6	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0480	1.98	30.00	.87	22.00	1.34	23.00	1.32	24.00	<.10	.00	.36 VL	16.50
W0482	2.09	44.00	1.42 EH	73.00	1.53	40.00	2.20 EH	75.00	.16 EH	48.50	.20 EL	7.00
W0489	.45 EL	2.50	.43 EL	8.00	.54 EL	4.00	.30 EL	2.00	.05	32.00	.05 EL	4.00
W0493	2.19	58.50	.98	30.00	1.62	58.50	1.65	62.00	.08 H	39.50	.43	19.50
W0497	2.36	71.00	1.19	67.50	1.79 H	72.50	1.75	70.00	.12 EH	46.00	.65 H	68.50
W0498	2.52 H	75.00	2.00 EH	75.00	1.66	63.50	1.70	66.50	.00	6.50	1.46 EH	75.00
W0506	2.10	45.50	1.10	58.00	1.60	53.50	1.45	33.00	<.05	.00	.50	30.50
W0511	2.43 H	72.00	1.23 H	72.00	1.78	71.00	1.79 H	73.00	.15 EH	47.00	.71 VH	71.00
W0514	1.50 L	17.00	.90	23.00	.90 EL	10.50	1.23	19.50	.02	22.50	.30 EL	12.00
W0515	2.16	53.50	.96	26.00	1.55	45.00	1.53	46.50	<.1	.00	.49	27.50
W0516	1.82	22.00	.94	25.00	1.37	24.00	1.43	28.50	<.01	.00	.44	21.50
W0524	2.13	49.00	1.22 H	71.00	1.62	58.50	1.53	46.50	.23 EH	50.00	.60	61.50
W0526	2.16	53.50	1.09	55.00	1.40	25.00	1.40	26.00	<.02	.00	.58	58.00
W0528	1.10 EL	14.00	.70 VL	13.00	.94 VL	12.00	.825 EL	11.00	.004	13.00	.345 VL	15.00
W0529	2.00	35.00	1.00	35.50	1.50	37.00	1.45	33.00	.01	16.50	.52	37.50
W0533	1.90	25.00	1.08	53.00	1.48	32.00	1.48	37.00	<.05	.00	.58	58.00
W0535	2.20	61.00	1.11	61.00	1.58	48.50	1.70	66.50	.01	16.50	.67 H	70.00
W0538	2.00	35.00	1.20 H	69.50	1.59	50.50	1.50	40.00	.11 VH	45.00	.48	26.00
W0542	2.22	64.00	1.05	49.00	1.60	53.50	1.51	41.50	<.03	.00	.57	54.50
W0551	2.48 H	73.50	1.03	44.50	1.61	56.00	1.56	54.00	.01	16.50	.56	51.00
W0552	2.20	61.00	1.20 H	69.50	1.68	65.50	1.78 H	72.00	<.10	.00	.80 EH	73.00
W0999	2.08	43.00	.97	28.00	1.43	27.00	1.38	25.00	.00	6.50	.51	34.00
MEDIAN CONC.	2.010		1.000		1.500		1.480		.030		.520	

PARAMETER: 15092 TOTAL PHOSPHORUS-STP MG P/L

MISA INTERLAB STUDY 04 TOTAL P

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .15
BASIC ACCEPTABLE ERROR= .04 CONCENTRATION ERROR INCREMENT= .1800
LABORATORIES YET TO REPORT: W0353 W0268 W0534 W0045 W0311
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	TP7		TP8	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0009	.16	41.00	.15	30.00
W0017	.14	24.00	.15	30.00
W0023	.15	31.50	.125	20.00
W0028	.15	31.50	.12	17.00
W0042	.20 H	56.00	.25 EH	64.00
W0072	.17	46.00	.16	38.50
W0127	.05 EL	5.50	<.01	.00
W0147	.14	24.00	.14	24.50
W0148	.12	14.50	.14	24.50
W0149	.18	49.50	.20	58.00
W0179	.03 EL	2.00	.00 EL	1.00
W0198	.15	31.50	.16	38.50
W0211	.15	31.50	.13	21.00
W0233	.20 H	56.00	.16	38.50
W0238	.20 H	56.00	.21 H	61.00
W0239	.17	46.00	.12	17.00
W0243	.20 H	56.00	.16	38.50
W0247	.13	19.00	.10 L	11.50
W0248	.03 EL	2.00	.04 EL	4.00
W0255	.16	41.00	.17	47.00
W0266	.12	14.50	.15	30.00
W0305	.12	14.50	.15	30.00
W0335	.32 EH	68.00	.33 EH	71.00
W0336	.25 EH	63.00	.20	58.00
W0337	.24 VH	62.00	.21 H	61.00
W0364	.269 EH	65.00	.267 EH	66.00
W0370	.07 EL	8.50	.01 EL	2.00
W0377	.2 H	56.00	.03 EL	3.00
W0380	.08 VL	10.00	.108 L	13.00
W0382	.07 EL	8.50	.10 L	11.50
W0389	.09 VL	11.00	.09 VL	10.00
W0404	.34 EH	70.00	.32 EH	69.50
W0417	.15	31.50	.15	30.00
W0418	.17	46.00	.18	53.50
W0427	.14	24.00	.17	47.00
W0428	.213 H	61.00	.199	56.00
W0429	.21 H	59.50	.24 VH	63.00
W0431	.13	19.00	.12	17.00
W0433	.21 H	59.50	.26 EH	65.00
W0439	.83 EH	74.00	4.95 EH	73.00
W0441	.18	49.50	.17	47.00
W0447	.17	46.00	.16	38.50
W0448	.26 EH	64.00	.17	47.00
W0456	.19	52.00	.16	38.50
W0460	.15	31.50	.17	47.00
W0462	.158	37.50	.172	52.00
W0463	.156	36.00	.136	22.00
W0464	.03 EL	2.00	.05 EL	6.50
W0468	.14	24.00	.15	30.00
W0469	.377 EH	71.00	.301 EH	67.00
W0471	.05 EL	5.50	.05 EL	6.50
W0476	.127	17.00	.124	19.00
W0477	.150	31.50	.210 H	61.00
W0480	<.10	.00	<.10	.00

PARAMETER: 15092 TOTAL PHOSPHORUS-STP MG P/L

MISA INTERLAB STUDY 04 TOTAL P

LOWER LIMIT FOR USE OF BASIC ACCEPTABLE ERROR= .15
BASIC ACCEPTABLE ERROR= .04 CONCENTRATION ERROR INCREMENT= .1800
LABORATORIES YET TO REPORT: W0353 W0268 W0534 W0045 W0311
LABORATORY RESULTS OMITTED ARE NONE

SAMPLE	TP7		TP8	
LAB NO	REPORTED VALUE	RANK	REPORTED VALUE	RANK
W0482	.05 EL	5.50	.05 EL	6.50
W0489	.05 EL	5.50	.05 EL	6.50
W0493	.13	19.00	.17	47.00
W0497	.29 EH	66.00	.31 EH	68.00
W0498	.72 EH	73.00	.11 L	14.50
W0506	.15	31.50	.17	47.00
W0511	.33 EH	69.00	.34 EH	72.00
W0514	.14	24.00	.14	24.50
W0515	.14	24.00	.11 L	14.50
W0516	.12	14.50	.19	55.00
W0524	.30 EH	67.00	.32 EH	69.50
W0526	.17	46.00	.17	47.00
W0528	.1045 L	12.00	.0885 VL	9.00
W0529	.16	41.00	.16	38.50
W0533	.16	41.00	.17	47.00
W0535	.158	37.50	.154	34.00
W0538	.19	52.00	.18	53.50
W0542	.16	41.00	.15	30.00
W0551	.19	52.00	.16	38.50
W0552	.42 EH	72.00	.20	58.00
W0999	.14	24.00	.14	24.50
MEDIAN CONC.	.158		.160	

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING	METHOD CODING
W0009	269.00	33.625	8		A2
W0017	182.00	22.750	8	EL VLVL	A1
W0023	379.00	47.375	8	EH	A1
W0028	319.00	39.875	8		A2
W0042	382.00	47.750	8	H H EH	H
W0072	319.50	45.643	7		E1
W0127	86.00	12.286	7	ELELELELVHELEL	BIASED LOW A1
W0147	194.00	24.250	8	H	E2
W0148	201.00	25.125	8		E1
W0149	417.50	52.188	8	H	F
W0179	62.00	7.750	8	ELELELELH ELELEL	BIASED LOW A1
W0198	164.50	20.563	8	ELL ELEL	A1
W0211	261.00	32.625	8		F
W0233	313.50	39.188	8	H	F
W0238	442.00	55.250	8	H H	B2
W0239	306.00	38.250	8		A1
W0243	401.00	50.125	8	H H	B1
W0247	135.00	16.875	8	L EL EL L	A1
W0248	112.50	14.063	8	ELELEL VLELEL	A1
W0255	363.50	45.438	8		A1
W0266	207.00	25.875	8		A2
W0305	207.00	25.875	8		A2
W0335	262.00	32.750	8	EL VL EHEH	A1
W0336	513.50	64.188	8	EHH EHEHEH	BIASED HIGH F
W0337	426.50	53.313	8	VHH	H
W0364	331.00	41.375	8	VHVLEHEH	A2
W0370	205.50	25.688	8	L L ELEL	A2
W0377	167.00	20.875	8	ELEL ELH EL	A1
W0380	118.50	14.813	8	ELVLELVLEHELVLL	A1
W0382	112.50	14.063	8	EL L EL ELELL	H
W0389	62.50	7.813	8	ELELVLEL ELVLVL	BIASED LOW H
W0404	236.50	29.563	8	ELELELVLEH EHEH	B1
W0417	171.50	24.500	7	VL L L	E1
W0418	296.00	42.286	7		G
W0427	359.00	44.875	8	H EHH	E1
W0428	438.50	62.643	7	VH H VH	BIASED HIGH B1
W0429	343.50	42.938	8		G
W0431	298.00	37.250	8	H EH	E1
W0433	446.00	55.750	8	ELVLELEHELEHEH	B1
W0439	250.00	31.250	8		D
W0441	276.50	34.563	8		B1
W0447	315.00	39.375	8	EH	B1
W0448	371.00	53.000	7	H H H	D
W0456	413.50	59.071	7		B1
W0460	300.00	42.857	7		C1
W0462	358.50	51.214	7		E2
W0463	317.00	45.286	7		B2
W0464	36.50	5.214	7	ELELELEL ELELEL	BIASED LOW B1
W0468	144.00	20.571	7	ELVLELEL	E1
W0469	495.00	61.875	8	H EHEH	BIASED HIGH D
W0471	26.50	3.786	7	ELELELEL ELELEL	BIASED LOW B1
W0476	133.50	19.071	7		G
W0477	425.00	53.125	8	H	B1
W0480	115.50	23.100	5	VL	C1
W0482	299.50	37.438	8	EH EHEHELELEL	B2
W0489	64.50	8.063	8	ELELELEL ELELEL	BIASED LOW E1
W0493	334.00	41.750	8	H	E2
W0497	529.50	66.188	8	H EHH EHEH	BIASED HIGH G
W0498	449.00	56.125	8	H EH EHEHL	D
W0506	299.00	42.714	7		B1
W0511	547.00	68.375	8	H H H EHVHEHEH	BIASED HIGH G
W0514	153.00	19.125	8	L EL EL	B1
W0515	237.00	33.857	7	L	G
W0516	190.50	27.214	7		D
W0524	473.00	59.125	8	H EH EHEH	G
W0526	310.50	44.357	7		C1

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
W0528	99.00	12.375	8	ELVLVLEL VLL VL	BIASED LOW	C1
W0529	274.00	34.250	8			B1
W0533	293.00	41.857	7			B1
W0535	395.00	49.375	8	H		C1
W0538	371.50	46.438	8	H VH		C1
W0542	333.50	47.643	7			G
W0551	386.00	48.250	8	H		E1
W0552	471.00	67.286	7	H H EHEH	BIASED HIGH	D
W0999	212.00	26.500	8			B1

OVERALL AVERAGE RANK IS 36.825

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
W0471	26.50	3.786	7	ELELELELELELEL	BIASED LOW	B1
W0464	36.50	5.214	7	ELELELELELELEL	BIASED LOW	B1
W0179	62.00	7.750	8	ELELELELHELELEL	BIASED LOW	A1
W0389	62.50	7.813	8	ELELVLELELVLVL	BIASED LOW	H
W0489	64.50	8.063	8	ELELELELELELEL	BIASED LOW	E1
W0127	86.00	12.286	7	ELELELELVHELEL	BIASED LOW	A1
W0528	99.00	12.375	8	ELVLVLELVLLVL	BIASED LOW	C1
W0382	112.50	14.063	8	ELLELELELL		H
W0248	112.50	14.063	8	ELELELVLELEL		A1
W0380	118.50	14.813	8	ELVLELVLEHELVLL		A1
W0247	135.00	16.875	8	LELELL		A1
W0476	133.50	19.071	7			G
W0514	153.00	19.125	8	LELEL		B1
W0198	164.50	20.563	8	ELLELEL		A1
W0468	144.00	20.571	7	ELVLELEL		E1
W0377	167.00	20.875	8	ELELELHEL		A1
W0017	182.00	22.750	8	ELVLVL		A1
W0480	115.50	23.100	5	VL		C1
W0147	194.00	24.250	8	H		E2
W0417	171.50	24.500	7	VLLL		E1
W0148	201.00	25.125	8			E1
W0370	205.50	25.688	8	LLELEL		A2
W0266	207.00	25.875	8			A2
W0305	207.00	25.875	8			A2
W0999	212.00	26.500	8			B1
W0516	190.50	27.214	7			D
W0404	236.50	29.563	8	ELELELVLEHEHEH		B1
W0439	250.00	31.250	8	ELVLELEHELEHEH		D
W0211	261.00	32.625	8			F
W0335	262.00	32.750	8	ELVLEHEH		A1
W0009	269.00	33.625	8			A2
W0515	237.00	33.857	7	L		G
W0529	274.00	34.250	8			B1
W0441	276.50	34.563	8			B1
W0431	298.00	37.250	8			E1
W0482	299.50	37.438	8	EHEHEHELELEL		B2
W0239	306.00	38.250	8			A1
W0233	313.50	39.188	8	H		F
W0447	315.00	39.375	8			B1
W0028	319.00	39.875	8			A2
W0364	331.00	41.375	8	VHVLEHEH		A2
W0493	334.00	41.750	8	H		E2
W0533	293.00	41.857	7			B1
W0418	296.00	42.286	7			G
W0506	299.00	42.714	7			B1
W0460	300.00	42.857	7			C1
W0429	343.50	42.938	8	VHHVH		G
W0526	310.50	44.357	7			C1
W0427	359.00	44.875	8			E1
W0463	317.00	45.286	7			B2
W0255	363.50	45.438	8			A1
W0072	319.50	45.643	7			E1
W0538	371.50	46.438	8	HVH		C1
W0023	379.00	47.375	8	EH		A1
W0542	333.50	47.643	7			G
W0042	382.00	47.750	8	HHEH		H
W0551	386.00	48.250	8	H		E1
W0535	395.00	49.375	8	H		C1
W0243	401.00	50.125	8	HH		B1
W0462	358.50	51.214	7			E2
W0149	417.50	52.188	8	H		F
W0448	371.00	53.000	7	EH		D
W0477	425.00	53.125	8	H		B1
W0337	426.50	53.313	8	VHH		H
W0238	442.00	55.250	8	HH		B2
W0433	446.00	55.750	8	HEH		B1

LAB NO.	TOTAL RANK	AVERAGE RANK	NO.OF SAMPLES RANKED	SUMMARY OF FLAGGING		METHOD CODING
W0498	449.00	56.125	8	HEHEHEHL		D
W0456	413.50	59.071	7	HHH		B1
W0524	473.00	59.125	8	HEHEHEH		G
W0469	495.00	61.875	8	HEHEH	BIASED HIGH	D
W0428	438.50	62.643	7	HEHH	BIASED HIGH	B1
W0336	513.50	64.188	8	EHHEHEHEH	BIASED HIGH	F
W0497	529.50	66.188	8	HEHHEHEH	BIASED HIGH	G
W0552	471.00	67.286	7	HHEHEH	BIASED HIGH	D
W0511	547.00	68.375	8	HHHEHVHEHEH	BIASED HIGH	G

OVERALL AVERAGE RANK IS 36.825

Appendix 4: COMPARISON OF LABORATORY PERFORMANCE

COMPARISON OF LABORATORY PERFORMANCE (SS)

	BIAS				FLAGS		
LAB CODE	NO. OF PARAMETERS ANALYZED	NO. OF PARAMETERS BIASED	PERCENTAGE OF PARAMETERS BIASED (%)	NO. OF RESULTS RANKED	NO. OF FLAGS ASSIGNED	PERCENTAGE OF RESULTS FLAGGED (%)	SUM OF % BIAS AND % FLAGS SCORE
W0009	1	0	.00	9	2	22.22	22.22
W0023	1	1	100.00	9	4	44.44	144.44
W0028	1	0	.00	9	2	22.22	22.22
W0042	1	0	.00	9	0	.00	.00
W0072	1	0	.00	9	1	11.11	11.11
W0127	1	0	.00	9	0	.00	.00
W0147	1	0	.00	9	1	11.11	11.11
W0148	1	0	.00	9	0	.00	.00
W0149	1	0	.00	9	0	.00	.00
W0179	1	0	.00	9	3	33.33	33.33
W0198	1	0	.00	9	2	22.22	22.22
W0211	1	0	.00	9	0	.00	.00
W0238	1	0	.00	9	1	11.11	11.11
W0239	1	0	.00	9	2	22.22	22.22
W0243	1	0	.00	9	1	11.11	11.11
W0247	1	1	100.00	9	7	77.78	177.78
W0248	1	0	.00	9	0	.00	.00
W0255	1	0	.00	9	3	33.33	33.33
W0266	1	0	.00	9	1	11.11	11.11
W0305	1	0	.00	9	0	.00	.00
W0335	1	0	.00	9	4	44.44	44.44
W0337	1	1	100.00	9	8	88.89	188.89
W0364	1	0	.00	9	0	.00	.00
W0370	1	0	.00	9	0	.00	.00
W0377	1	0	.00	9	7	77.78	77.78
W0380	1	0	.00	9	2	22.22	22.22
W0390	1	0	.00	9	0	.00	.00
W0404	1	0	.00	9	7	77.78	77.78
W0417	1	0	.00	8	1	12.50	12.50
W0418	1	0	.00	8	1	12.50	12.50
W0427	1	1	100.00	9	4	44.44	144.44
W0428	1	0	.00	8	2	25.00	25.00
W0429	1	0	.00	8	2	25.00	25.00
W0430	1	0	.00	9	5	55.56	55.56
W0431	1	0	.00	8	1	12.50	12.50
W0433	1	0	.00	8	1	12.50	12.50
W0439	1	0	.00	8	4	50.00	50.00
W0441	1	0	.00	9	1	11.11	11.11
W0447	1	0	.00	9	6	66.67	66.67
W0448	1	0	.00	8	0	.00	.00
W0456	1	1	100.00	8	7	87.50	187.50
W0460	1	0	.00	9	0	.00	.00
W0462	1	1	100.00	9	5	55.56	155.56
W0463	1	0	.00	9	0	.00	.00
W0464	1	0	.00	8	3	37.50	37.50
W0468	1	0	.00	8	2	25.00	25.00
W0471	1	0	.00	9	0	.00	.00
W0476	1	0	.00	8	3	37.50	37.50
W0477	1	0	.00	9	0	.00	.00
W0480	1	0	.00	8	1	12.50	12.50
W0482	1	0	.00	8	1	12.50	12.50
W0485	1	0	.00	8	0	.00	.00
W0489	1	0	.00	9	0	.00	.00
W0493	1	0	.00	8	3	37.50	37.50
W0497	1	0	.00	8	0	.00	.00
W0498	1	0	.00	9	4	44.44	44.44
W0506	1	0	.00	8	0	.00	.00
W0511	1	0	.00	9	0	.00	.00
W0514	1	0	.00	9	1	11.11	11.11
W0516	1	0	.00	9	0	.00	.00
W0524	1	0	.00	9	4	44.44	44.44
W0526	1	0	.00	9	2	22.22	22.22
W0528	1	0	.00	8	0	.00	.00
W0529	1	0	.00	9	2	22.22	22.22
W0533	1	0	.00	9	1	11.11	11.11
W0535	1	0	.00	9	2	22.22	22.22
W0538	1	0	.00	9	3	33.33	33.33
W0542	1	0	.00	8	1	12.50	12.50
W0551	1	0	.00	8	3	37.50	37.50
W0552	1	0	.00	9	1	11.11	11.11
W0999	1	0	.00	9	2	22.22	22.22

THE FOLLOWING CODES WERE USED IN THE ANALYSIS
00100

COMPARISON OF LABORATORY PERFORMANCE (BOD)

	BIAS				FLAGS		
LAB CODE	NO. OF PARAMETERS ANALYZED	NO. OF PARAMETERS BIASED	PERCENTAGE OF PARAMETERS BIASED (%)	NO. OF RESULTS RANKED	NO. OF FLAGS ASSIGNED	PERCENTAGE OF RESULTS FLAGGED (%)	SUM OF % BIAS AND % FLAGS SCORE
W0042	1	0	.00	8	4	50.00	50.00
W0072	1	1	100.00	8	3	37.50	137.50
W0147	1	1	100.00	8	5	62.50	162.50
W0148	1	1	100.00	8	6	75.00	175.00
W0149	1	1	100.00	8	4	50.00	150.00
W0211	1	0	.00	8	1	12.50	12.50
W0238	1	0	.00	8	0	.00	.00
W0239	1	1	100.00	8	4	50.00	150.00
W0243	1	0	.00	8	3	37.50	37.50
W0248	1	0	.00	8	0	.00	.00
W0255	1	0	.00	6	6	100.00	100.00
W0335	1	0	.00	8	4	50.00	50.00
W0337	1	0	.00	8	0	.00	.00
W0364	1	0	.00	8	0	.00	.00
W0404	1	0	.00	8	5	62.50	62.50
W0417	1	0	.00	8	0	.00	.00
W0418	1	1	100.00	7	3	42.86	142.86
W0427	1	1	100.00	8	3	37.50	137.50
W0428	1	0	.00	7	2	28.57	28.57
W0429	1	1	100.00	8	6	75.00	175.00
W0430	1	0	.00	8	0	.00	.00
W0431	1	0	.00	8	0	.00	.00
W0433	1	0	.00	8	0	.00	.00
W0439	1	0	.00	8	2	25.00	25.00
W0441	1	0	.00	8	0	.00	.00
W0447	1	0	.00	8	1	12.50	12.50
W0456	1	1	100.00	8	5	62.50	162.50
W0460	1	0	.00	8	0	.00	.00
W0462	1	0	.00	8	0	.00	.00
W0463	1	0	.00	8	1	12.50	12.50
W0464	1	0	.00	8	2	25.00	25.00
W0468	1	0	.00	8	3	37.50	37.50
W0471	1	1	100.00	8	6	75.00	175.00
W0476	1	0	.00	8	3	37.50	37.50
W0477	1	0	.00	8	1	12.50	12.50
W0480	1	0	.00	8	0	.00	.00
W0482	1	0	.00	8	0	.00	.00
W0485	1	0	.00	8	2	25.00	25.00
W0489	1	0	.00	8	5	62.50	62.50
W0493	1	0	.00	8	0	.00	.00
W0497	1	0	.00	8	3	37.50	37.50
W0498	1	0	.00	8	0	.00	.00
W0506	1	0	.00	8	0	.00	.00
W0511	1	0	.00	8	0	.00	.00
W0514	1	0	.00	8	3	37.50	37.50
W0516	1	0	.00	8	1	12.50	12.50
W0524	1	0	.00	8	1	12.50	12.50
W0526	1	0	.00	8	0	.00	.00
W0528	1	0	.00	8	3	37.50	37.50
W0529	1	0	.00	8	7	87.50	87.50
W0533	1	0	.00	8	0	.00	.00
W0535	1	0	.00	8	3	37.50	37.50
W0538	1	0	.00	8	2	25.00	25.00
W0542	1	0	.00	8	1	12.50	12.50
W0551	1	0	.00	8	2	25.00	25.00
W0552	1	0	.00	8	1	12.50	12.50
W0999	1	0	.00	8	2	25.00	25.00

THE FOLLOWING CODES WERE USED IN THE ANALYSIS
00200

COMPARISON OF LABORATORY PERFORMANCE (pH)

	BIAS				FLAGS		
LAB CODE	NO. OF PARAMETERS ANALYZED	NO. OF PARAMETERS BIASED	PERCENTAGE OF PARAMETERS BIASED (%)	NO. OF RESULTS RANKED	NO. OF FLAGS ASSIGNED	PERCENTAGE OF RESULTS FLAGGED (%)	SUM OF % BIAS AND % FLAGS SCORE
W0009	1	0	.00	8	0	.00	.00
W0010	1	0	.00	8	1	12.50	12.50
W0017	1	0	.00	8	4	50.00	50.00
W0021	1	0	.00	8	2	25.00	25.00
W0023	1	0	.00	8	1	12.50	12.50
W0028	1	0	.00	8	1	12.50	12.50
W0042	1	0	.00	8	1	12.50	12.50
W0072	1	0	.00	8	0	.00	.00
W0127	1	0	.00	8	1	12.50	12.50
W0147	1	0	.00	8	3	37.50	37.50
W0148	1	0	.00	8	0	.00	.00
W0149	1	0	.00	8	1	12.50	12.50
W0179	1	0	.00	8	1	12.50	12.50
W0190	1	0	.00	8	0	.00	.00
W0198	1	1	100.00	8	2	25.00	125.00
W0211	1	0	.00	8	3	37.50	37.50
W0233	1	1	100.00	8	5	62.50	162.50
W0238	1	0	.00	8	1	12.50	12.50
W0239	1	0	.00	8	2	25.00	25.00
W0247	1	0	.00	8	1	12.50	12.50
W0248	1	0	.00	8	2	25.00	25.00
W0255	1	0	.00	8	2	25.00	25.00
W0266	1	0	.00	8	3	37.50	37.50
W0305	1	0	.00	8	3	37.50	37.50
W0335	1	0	.00	8	5	62.50	62.50
W0336	1	0	.00	8	1	12.50	12.50
W0337	1	0	.00	8	0	.00	.00
W0364	1	0	.00	8	1	12.50	12.50
W0370	1	0	.00	8	2	25.00	25.00
W0377	1	0	.00	8	2	25.00	25.00
W0380	1	1	100.00	8	2	25.00	125.00
W0382	1	0	.00	8	1	12.50	12.50
W0389	1	0	.00	8	1	12.50	12.50
W0404	1	0	.00	8	2	25.00	25.00
W0417	1	0	.00	8	1	12.50	12.50
W0418	1	0	.00	8	2	25.00	25.00
W0427	1	0	.00	8	2	25.00	25.00
W0428	1	1	100.00	8	2	25.00	125.00
W0429	1	0	.00	8	1	12.50	12.50
W0431	1	0	.00	8	1	12.50	12.50
W0433	1	0	.00	8	1	12.50	12.50
W0439	1	0	.00	8	1	12.50	12.50
W0441	1	1	100.00	8	5	62.50	162.50
W0447	1	0	.00	8	1	12.50	12.50
W0448	1	0	.00	8	0	.00	.00
W0456	1	0	.00	8	1	12.50	12.50
W0460	1	0	.00	8	2	25.00	25.00
W0462	1	0	.00	8	2	25.00	25.00
W0463	1	0	.00	8	2	25.00	25.00
W0464	1	0	.00	8	1	12.50	12.50
W0468	1	0	.00	8	3	37.50	37.50
W0469	1	0	.00	8	1	12.50	12.50
W0471	1	0	.00	8	6	75.00	75.00
W0476	1	0	.00	8	0	.00	.00
W0477	1	0	.00	8	1	12.50	12.50
W0480	1	0	.00	8	0	.00	.00
W0482	1	0	.00	8	1	12.50	12.50
W0489	1	0	.00	8	0	.00	.00
W0493	1	0	.00	8	2	25.00	25.00
W0497	1	0	.00	8	0	.00	.00
W0498	1	1	100.00	8	4	50.00	150.00
W0506	1	0	.00	8	4	50.00	50.00
W0511	1	0	.00	8	1	12.50	12.50
W0514	1	0	.00	8	0	.00	.00
W0515	1	0	.00	8	2	25.00	25.00
W0516	1	0	.00	8	2	25.00	25.00
W0524	1	0	.00	8	4	50.00	50.00
W0526	1	0	.00	8	0	.00	.00

COMPARISON OF LABORATORY PERFORMANCE (pH)

	BIAS				FLAGS		
LAB CODE	NO. OF PARAMETERS ANALYZED	NO. OF PARAMETERS BIASED	PERCENTAGE OF PARAMETERS BIASED (%)	NO. OF RESULTS RANKED	NO. OF FLAGS ASSIGNED	PERCENTAGE OF RESULTS FLAGGED (%)	SUM OF % BIAS AND % FLAGS SCORE
W0528	1	0	.00	8	2	25.00	25.00
W0529	1	0	.00	8	2	25.00	25.00
W0533	1	0	.00	8	6	75.00	75.00
W0535	1	0	.00	8	0	.00	.00
W0538	1	1	100.00	8	4	50.00	150.00
W0542	1	0	.00	8	1	12.50	12.50
W0551	1	0	.00	8	0	.00	.00
W0552	1	0	.00	8	1	12.50	12.50
W0999	1	0	.00	8	1	12.50	12.50

THE FOLLOWING CODES WERE USED IN THE ANALYSIS
01092

COMPARISON OF LABORATORY PERFORMANCE (Total P)

	BIAS				FLAGS		
LAB CODE	NO. OF PARAMETERS ANALYZED	NO. OF PARAMETERS BIASED	PERCENTAGE OF PARAMETERS BIASED (%)	NO. OF RESULTS RANKED	NO. OF FLAGS ASSIGNED	PERCENTAGE OF RESULTS FLAGGED (%)	SUM OF % BIAS AND % FLAGS SCORE
W0009	1	0	.00	8	0	.00	.00
W0017	1	0	.00	8	3	37.50	37.50
W0023	1	0	.00	8	1	12.50	12.50
W0028	1	0	.00	8	0	.00	.00
W0042	1	0	.00	8	3	37.50	37.50
W0072	1	0	.00	7	0	.00	.00
W0127	1	1	100.00	7	7	100.00	200.00
W0147	1	0	.00	8	1	12.50	12.50
W0148	1	0	.00	8	0	.00	.00
W0149	1	0	.00	8	1	12.50	12.50
W0179	1	1	100.00	8	8	100.00	200.00
W0198	1	0	.00	8	4	50.00	50.00
W0211	1	0	.00	8	0	.00	.00
W0233	1	0	.00	8	1	12.50	12.50
W0238	1	0	.00	8	2	25.00	25.00
W0239	1	0	.00	8	0	.00	.00
W0243	1	0	.00	8	2	25.00	25.00
W0247	1	0	.00	8	4	50.00	50.00
W0248	1	0	.00	8	6	75.00	75.00
W0255	1	0	.00	8	0	.00	.00
W0266	1	0	.00	8	0	.00	.00
W0305	1	0	.00	8	0	.00	.00
W0335	1	0	.00	8	4	50.00	50.00
W0336	1	1	100.00	8	5	62.50	162.50
W0337	1	0	.00	8	2	25.00	25.00
W0364	1	0	.00	8	4	50.00	50.00
W0370	1	0	.00	8	4	50.00	50.00
W0377	1	0	.00	8	5	62.50	62.50
W0380	1	0	.00	8	8	100.00	100.00
W0382	1	0	.00	8	6	75.00	75.00
W0389	1	1	100.00	8	7	87.50	187.50
W0404	1	0	.00	8	7	87.50	87.50
W0417	1	0	.00	7	3	42.86	42.86
W0418	1	0	.00	7	0	.00	.00
W0427	1	0	.00	8	0	.00	.00
W0428	1	1	100.00	7	3	42.86	142.86
W0429	1	0	.00	8	3	37.50	37.50
W0431	1	0	.00	8	0	.00	.00
W0433	1	0	.00	8	2	25.00	25.00
W0439	1	0	.00	8	7	87.50	87.50
W0441	1	0	.00	8	0	.00	.00
W0447	1	0	.00	8	0	.00	.00
W0448	1	0	.00	7	1	14.29	14.29
W0456	1	0	.00	7	3	42.86	42.86
W0460	1	0	.00	7	0	.00	.00
W0462	1	0	.00	7	0	.00	.00
W0463	1	0	.00	7	0	.00	.00
W0464	1	1	100.00	7	7	100.00	200.00
W0468	1	0	.00	7	4	57.14	57.14
W0469	1	1	100.00	8	3	37.50	137.50
W0471	1	1	100.00	7	7	100.00	200.00
W0476	1	0	.00	7	0	.00	.00
W0477	1	0	.00	8	1	12.50	12.50
W0480	1	0	.00	5	1	20.00	20.00
W0482	1	0	.00	8	6	75.00	75.00
W0489	1	1	100.00	8	7	87.50	187.50
W0493	1	0	.00	8	1	12.50	12.50
W0497	1	1	100.00	8	5	62.50	162.50
W0498	1	0	.00	8	5	62.50	62.50
W0506	1	0	.00	7	0	.00	.00
W0511	1	1	100.00	8	7	87.50	187.50
W0514	1	0	.00	8	3	37.50	37.50
W0515	1	0	.00	7	1	14.29	14.29
W0516	1	0	.00	7	0	.00	.00
W0524	1	0	.00	8	4	50.00	50.00

COMPARISON OF LABORATORY PERFORMANCE (Total P)

	BIAS				FLAGS		
LAB CODE	NO. OF PARAMETERS ANALYZED	NO. OF PARAMETERS BIASED	PERCENTAGE OF PARAMETERS BIASED (%)	NO. OF RESULTS RANKED	NO. OF FLAGS ASSIGNED	PERCENTAGE OF RESULTS FLAGGED (%)	SUM OF % BIAS AND % FLAGS SCORE
W0526	1	0	.00	7	0	.00	.00
W0528	1	1	100.00	8	7	87.50	187.50
W0529	1	0	.00	8	0	.00	.00
W0533	1	0	.00	7	0	.00	.00
W0535	1	0	.00	8	1	12.50	12.50
W0538	1	0	.00	8	2	25.00	25.00
W0542	1	0	.00	7	0	.00	.00
W0551	1	0	.00	8	1	12.50	12.50
W0552	1	1	100.00	7	4	57.14	157.14
W0999	1	0	.00	8	0	.00	.00

THE FOLLOWING CODES WERE USED IN THE ANALYSIS
15092

COMPARISON OF LABORATORY PERFORMANCE (SS, BOD, pH, Total P)

	BIAS				FLAGS		
LAB CODE	NO. OF PARAMETERS ANALYZED	NO. OF PARAMETERS BIASED	PERCENTAGE OF PARAMETERS BIASED (%)	NO. OF RESULTS RANKED	NO. OF FLAGS ASSIGNED	PERCENTAGE OF RESULTS FLAGGED (%)	SUM OF % BIAS AND % FLAGS SCORE
W0471	4	2	50.00	31	19	61.29	111.29
W0456	4	2	50.00	31	16	51.61	101.61
W0389	2	1	50.00	16	8	50.00	100.00
W0233	2	1	50.00	16	6	37.50	87.50
W0336	2	1	50.00	16	6	37.50	87.50
W0179	3	1	33.33	24	12	50.00	83.33
W0380	3	1	33.33	24	12	50.00	83.33
W0247	3	1	33.33	24	12	50.00	83.33
W0430	2	1	50.00	16	5	31.25	81.25
W0428	4	2	50.00	30	9	30.00	80.00
W0427	4	2	50.00	32	9	28.13	78.13
W0469	2	1	50.00	16	4	25.00	75.00
W0127	3	1	33.33	23	8	34.78	68.12
W0464	4	1	25.00	31	13	41.94	66.94
W0198	3	1	33.33	24	8	33.33	66.67
W0498	4	1	25.00	32	13	40.63	65.63
W0404	4	0	.00	32	21	65.63	65.63
W0528	4	1	25.00	32	12	37.50	62.50
W0429	4	1	25.00	32	12	37.50	62.50
W0489	4	1	25.00	32	12	37.50	62.50
W0538	4	1	25.00	32	11	34.38	59.38
W0023	3	1	33.33	24	6	25.00	58.33
W0377	3	0	.00	24	14	58.33	58.33
W0147	4	1	25.00	32	10	31.25	56.25
W0337	4	1	25.00	32	10	31.25	56.25
W0335	4	0	.00	32	17	53.13	53.13
W0239	4	1	25.00	32	8	25.00	50.00
W0511	4	1	25.00	32	8	25.00	50.00
W0248	4	1	25.00	32	8	25.00	50.00
W0497	4	1	25.00	32	8	25.00	50.00
W0462	4	1	25.00	31	7	22.58	47.58
W0552	4	1	25.00	31	7	22.58	47.58
W0418	4	1	25.00	30	6	20.00	45.00
W0017	2	0	.00	16	7	43.75	43.75
W0439	4	0	.00	32	14	43.75	43.75
W0148	4	1	25.00	32	6	18.75	43.75
W0382	2	0	.00	16	7	43.75	43.75
W0149	4	1	25.00	32	6	18.75	43.75
W0441	4	1	25.00	32	6	18.75	43.75
W0524	4	0	.00	32	13	40.63	40.63
W0468	4	0	.00	31	12	38.71	38.71
W0072	4	1	25.00	31	4	12.90	37.90
W0255	4	0	.00	30	11	36.67	36.67
W0529	4	0	.00	32	11	34.38	34.38
W0021	1	0	.00	8	2	25.00	25.00
W0370	3	0	.00	24	6	25.00	25.00
W0243	3	0	.00	24	6	25.00	25.00
W0482	4	0	.00	32	8	25.00	25.00
W0042	4	0	.00	32	8	25.00	25.00
W0447	4	0	.00	32	8	25.00	25.00
W0533	4	0	.00	31	7	22.58	22.58
W0514	4	0	.00	32	7	21.88	21.88
W0515	2	0	.00	15	3	20.00	20.00
W0476	4	0	.00	31	6	19.35	19.35
W0551	4	0	.00	32	6	18.75	18.75
W0493	4	0	.00	32	6	18.75	18.75
W0535	4	0	.00	32	6	18.75	18.75
W0266	3	0	.00	24	4	16.67	16.67
W0417	4	0	.00	31	5	16.13	16.13
W0999	4	0	.00	32	5	15.63	15.63

COMPARISON OF LABORATORY PERFORMANCE (SS, BOD, pH, Total P)

	BIAS				FLAGS		
LAB CODE	NO. OF PARAMETERS ANALYZED	NO. OF PARAMETERS BIASED	PERCENTAGE OF PARAMETERS BIASED (%)	NO. OF RESULTS RANKED	NO. OF FLAGS ASSIGNED	PERCENTAGE OF RESULTS FLAGGED (%)	SUM OF % BIAS AND % FLAGS SCORE
W0364	4	0	.00	32	5	15.63	15.63
W0506	4	0	.00	31	4	12.90	12.90
W0010	1	0	.00	8	1	12.50	12.50
W0433	4	0	.00	32	4	12.50	12.50
W0211	4	0	.00	32	4	12.50	12.50
W0485	2	0	.00	16	2	12.50	12.50
W0028	3	0	.00	24	3	12.50	12.50
W0305	3	0	.00	24	3	12.50	12.50
W0238	4	0	.00	32	4	12.50	12.50
W0542	4	0	.00	31	3	9.68	9.68
W0463	4	0	.00	31	3	9.68	9.68
W0516	4	0	.00	31	3	9.68	9.68
W0477	4	0	.00	32	3	9.38	9.38
W0009	3	0	.00	24	2	8.33	8.33
W0480	4	0	.00	29	2	6.90	6.90
W0460	4	0	.00	31	2	6.45	6.45
W0526	4	0	.00	31	2	6.45	6.45
W0431	4	0	.00	32	2	6.25	6.25
W0448	3	0	.00	23	1	4.35	4.35
W0190	1	0	.00	8	0	.00	.00
W0390	1	0	.00	8	0	.00	.00

THE FOLLOWING CODES WERE USED IN THE ANALYSIS
00100 01092 15092 00200

MOE/CAEAL Study, APPENDICES

Appendix 5: LABORATORY SPECIFIC APPRAISALS

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0009

SUSPENDED SOLIDS	FLAGGED LOW ON SAMPLE 1 FLAGGED EXTREMELY HIGH ON SAMPLE 2
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0010

SUSPENDED SOLIDS	NO RESULTS REPORTED.
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	SATISFACTORY EXCEPT FOR LOW ON SAMPLE 5
TOTAL PHOSPHORUS-STP	NO RESULTS REPORTED.

YOUR LABORATORY CODE IS W0017

SUSPENDED SOLIDS	NO RESULTS REPORTED.
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED VERY LOW ON SAMPLE 3 5 7 FLAGGED LOW ON SAMPLE 6
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 FLAGGED VERY LOW ON SAMPLE 3 4

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0021

SUSPENDED SOLIDS	NO RESULTS REPORTED.
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED HIGH ON SAMPLE 4 6
TOTAL PHOSPHORUS-STP	NO RESULTS REPORTED.

YOUR LABORATORY CODE IS W0023

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 2 FLAGGED VERY LOW ON SAMPLE 1 FLAGGED LOW ON SAMPLE 4 6 RANKING INDICATES RESULTS ARE BIASED LOW
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	SATISFACTORY EXCEPT FOR LOW ON SAMPLE 7
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY HIGH ON SAMPLE 5 THIS EXTREMELY HIGH RESULT SUGGESTS THE MEASUREMENT PROCESS IS OUT OF CONTROL

YOUR LABORATORY CODE IS W0028

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 8 FLAGGED EXTREMELY HIGH ON SAMPLE 9 THESE RESULTS ARE SLIGHTLY ERRATIC
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED EXTREMELY HIGH ON SAMPLE 2 THIS EXTREMELY HIGH RESULT SUGGESTS THE MEASUREMENT PROCESS IS OUT OF CONTROL
TOTAL PHOSPHORUS-STP	SATISFACTORY

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0042

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	FLAGGED VERY HIGH ON SAMPLE 6 FLAGGED EXTREMELY HIGH ON SAMPLE 5 7 8
PH	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 6
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 6 7 FLAGGED EXTREMELY HIGH ON SAMPLE 8

YOUR LABORATORY CODE IS W0072

SUSPENDED SOLIDS	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 1
BIOCHEMICAL DEMAND	FLAGGED LOW ON SAMPLE 1 4 8 RANKING INDICATES RESULTS ARE BIASED LOW
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0127

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED EXTREMELY LOW ON SAMPLE 3 THIS EXTREMELY LOW RESULT SUGGESTS THE MEASUREMENT PROCESS IS OUT OF CONTROL
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 2 3 4 6 7 FLAGGED VERY HIGH ON SAMPLE 5 RANKING INDICATES RESULTS ARE BIASED LOW

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0147

SUSPENDED SOLIDS	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 8
BIOCHEMICAL DEMAND	FLAGGED LOW ON SAMPLE 1 2 4 5 8 RANKING INDICATES RESULTS ARE BIASED LOW
PH	FLAGGED HIGH ON SAMPLE 3 FLAGGED VERY HIGH ON SAMPLE 4 FLAGGED EXTREMELY HIGH ON SAMPLE 6
TOTAL PHOSPHORUS-STP	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 5

YOUR LABORATORY CODE IS W0148

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	FLAGGED VERY LOW ON SAMPLE 5 FLAGGED LOW ON SAMPLE 1 3 6 7 8 RANKING INDICATES RESULTS ARE BIASED LOW
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0149

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	FLAGGED LOW ON SAMPLE 1 3 4 6 RANKING INDICATES RESULTS ARE BIASED LOW
PH	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 7
TOTAL PHOSPHORUS-STP	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 3

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0179

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 3 FLAGGED LOW ON SAMPLE 7 FLAGGED EXTREMELY HIGH ON SAMPLE 4 THESE RESULTS ARE SLIGHTLY ERRATIC
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	SATISFACTORY EXCEPT FOR LOW ON SAMPLE 4
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 2 3 4 6 7 8 FLAGGED HIGH ON SAMPLE 5 RANKING INDICATES RESULTS ARE BIASED LOW

YOUR LABORATORY CODE IS W0190

SUSPENDED SOLIDS	NO RESULTS REPORTED.
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	NO RESULTS REPORTED.

YOUR LABORATORY CODE IS W0198

SUSPENDED SOLIDS	FLAGGED VERY LOW ON SAMPLE 2 4
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED HIGH ON SAMPLE 3 FLAGGED VERY HIGH ON SAMPLE 6 RANKING INDICATES RESULTS ARE BIASED HIGH
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 3 4 FLAGGED LOW ON SAMPLE 2

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0211

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 5
PH	FLAGGED VERY LOW ON SAMPLE 3 FLAGGED LOW ON SAMPLE 5 7
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0233

SUSPENDED SOLIDS	NO RESULTS REPORTED.
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED EXTREMELY LOW ON SAMPLE 5 7 FLAGGED VERY LOW ON SAMPLE 3 4 FLAGGED LOW ON SAMPLE 6 RANKING INDICATES RESULTS ARE BIASED LOW
TOTAL PHOSPHORUS-STP	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 7

YOUR LABORATORY CODE IS W0238

SUSPENDED SOLIDS	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 1
BIOCHEMICAL DEMAND	SATISFACTORY
PH	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 6
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 7 8

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0239

SUSPENDED SOLIDS	FLAGGED LOW ON SAMPLE 9 FLAGGED HIGH ON SAMPLE 4
BIOCHEMICAL DEMAND	FLAGGED HIGH ON SAMPLE 3 FLAGGED VERY HIGH ON SAMPLE 5 8 FLAGGED EXTREMELY HIGH ON SAMPLE 7 RANKING INDICATES RESULTS ARE BIASED HIGH
PH	FLAGGED EXTREMELY LOW ON SAMPLE 1 8
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0243

SUSPENDED SOLIDS	SATISFACTORY EXCEPT FOR LOW ON SAMPLE 9
BIOCHEMICAL DEMAND	FLAGGED HIGH ON SAMPLE 5 8 FLAGGED EXTREMELY HIGH ON SAMPLE 2
PH	NO RESULTS REPORTED.
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 6 7

YOUR LABORATORY CODE IS W0247

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 2 6 9 FLAGGED VERY LOW ON SAMPLE 3 4 7 8 RANKING INDICATES RESULTS ARE BIASED LOW
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 4
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 4 6 FLAGGED LOW ON SAMPLE 2 8

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0248

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	SATISFACTORY
PH	FLAGGED EXTREMELY LOW ON SAMPLE 4 FLAGGED HIGH ON SAMPLE 1
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 2 3 4 7 8 FLAGGED VERY LOW ON SAMPLE 6

YOUR LABORATORY CODE IS W0255

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 6 FLAGGED HIGH ON SAMPLE 4 FLAGGED VERY HIGH ON SAMPLE 1 THESE RESULTS ARE SLIGHTLY ERRATIC
BIOCHEMICAL DEMAND	FLAGGED EXTREMELY LOW ON SAMPLE 5 FLAGGED EXTREMELY HIGH ON SAMPLE 1 2 3 4 6 THESE RESULTS ARE SLIGHTLY ERRATIC
PH	FLAGGED VERY LOW ON SAMPLE 6 FLAGGED LOW ON SAMPLE 7
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0266

SUSPENDED SOLIDS	FLAGGED EXTREMELY HIGH ON SAMPLE 4 THIS EXTREMELY HIGH RESULT SUGGESTS THE MEASUREMENT PROCESS IS OUT OF CONTROL
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED VERY LOW ON SAMPLE 5 FLAGGED LOW ON SAMPLE 3 6
TOTAL PHOSPHORUS-STP	SATISFACTORY

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0305

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED VERY LOW ON SAMPLE 5 FLAGGED LOW ON SAMPLE 3 6
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0335

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 4 6 7 FLAGGED LOW ON SAMPLE 1
BIOCHEMICAL DEMAND	FLAGGED EXTREMELY LOW ON SAMPLE 3 7 FLAGGED VERY LOW ON SAMPLE 4 FLAGGED HIGH ON SAMPLE 8
PH	FLAGGED VERY LOW ON SAMPLE 3 7 FLAGGED LOW ON SAMPLE 4 5 6
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 FLAGGED VERY LOW ON SAMPLE 3 FLAGGED EXTREMELY HIGH ON SAMPLE 7 8 THESE RESULTS ARE ERRATIC

YOUR LABORATORY CODE IS W0336

SUSPENDED SOLIDS	NO RESULTS REPORTED.
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 6
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 3 FLAGGED EXTREMELY HIGH ON SAMPLE 2 5 6 7 RANKING INDICATES RESULTS ARE BIASED HIGH

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0337

SUSPENDED SOLIDS	FLAGGED HIGH ON SAMPLE 8 FLAGGED VERY HIGH ON SAMPLE 6 9 FLAGGED EXTREMELY HIGH ON SAMPLE 1 2 3 4 7 RANKING INDICATES RESULTS ARE BIASED HIGH
BIOCHEMICAL DEMAND	SATISFACTORY
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 8 FLAGGED VERY HIGH ON SAMPLE 7

YOUR LABORATORY CODE IS W0364

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	SATISFACTORY
PH	FLAGGED EXTREMELY LOW ON SAMPLE 6 THIS EXTREMELY LOW RESULT SUGGESTS THE MEASUREMENT PROCESS IS OUT OF CONTROL
TOTAL PHOSPHORUS-STP	FLAGGED VERY LOW ON SAMPLE 6 FLAGGED VERY HIGH ON SAMPLE 5 FLAGGED EXTREMELY HIGH ON SAMPLE 7 8 THESE RESULTS ARE SLIGHTLY ERRATIC

YOUR LABORATORY CODE IS W0370

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED LOW ON SAMPLE 7 FLAGGED HIGH ON SAMPLE 3
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 7 8 FLAGGED LOW ON SAMPLE 2 4

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0377

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 6 FLAGGED EXTREMELY HIGH ON SAMPLE 1 2 3 4 8 9 THESE RESULTS ARE SLIGHTLY ERRATIC
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED LOW ON SAMPLE 7 FLAGGED HIGH ON SAMPLE 4
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 2 6 8 FLAGGED HIGH ON SAMPLE 7

YOUR LABORATORY CODE IS W0380

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 8 FLAGGED LOW ON SAMPLE 7
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED HIGH ON SAMPLE 7 FLAGGED VERY HIGH ON SAMPLE 4 RANKING INDICATES RESULTS ARE BIASED HIGH
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 3 6 FLAGGED VERY LOW ON SAMPLE 2 4 7 FLAGGED LOW ON SAMPLE 8 FLAGGED EXTREMELY HIGH ON SAMPLE 5 THESE RESULTS ARE SLIGHTLY ERRATIC

YOUR LABORATORY CODE IS W0382

SUSPENDED SOLIDS	NO RESULTS REPORTED.
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED VERY LOW ON SAMPLE 6
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 4 6 7 FLAGGED LOW ON SAMPLE 3 8

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0389

SUSPENDED SOLIDS	NO RESULTS REPORTED.
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED VERY HIGH ON SAMPLE 6
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 2 4 6 FLAGGED VERY LOW ON SAMPLE 3 7 8 RANKING INDICATES RESULTS ARE BIASED LOW

YOUR LABORATORY CODE IS W0390

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	NO RESULTS REPORTED.
TOTAL PHOSPHORUS-STP	NO RESULTS REPORTED.

YOUR LABORATORY CODE IS W0404

SUSPENDED SOLIDS	FLAGGED VERY LOW ON SAMPLE 1 3 6 8 9 FLAGGED LOW ON SAMPLE 7 FLAGGED EXTREMELY HIGH ON SAMPLE 2 THESE RESULTS ARE SLIGHTLY ERRATIC
BIOCHEMICAL DEMAND	FLAGGED LOW ON SAMPLE 3 5 FLAGGED VERY HIGH ON SAMPLE 7 FLAGGED EXTREMELY HIGH ON SAMPLE 6 8
PH	FLAGGED EXTREMELY LOW ON SAMPLE 4 FLAGGED VERY LOW ON SAMPLE 7
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 2 3 FLAGGED VERY LOW ON SAMPLE 4 FLAGGED EXTREMELY HIGH ON SAMPLE 5 7 8 THESE RESULTS ARE ERRATIC

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0417

SUSPENDED SOLIDS	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 4
BIOCHEMICAL DEMAND	SATISFACTORY
PH	FLAGGED VERY LOW ON SAMPLE 7
TOTAL PHOSPHORUS-STP	FLAGGED VERY LOW ON SAMPLE 1 FLAGGED LOW ON SAMPLE 3 4

YOUR LABORATORY CODE IS W0418

SUSPENDED SOLIDS	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 8
BIOCHEMICAL DEMAND	FLAGGED VERY LOW ON SAMPLE 6 FLAGGED LOW ON SAMPLE 3 7 RANKING INDICATES RESULTS ARE BIASED LOW
PH	FLAGGED HIGH ON SAMPLE 4 FLAGGED VERY HIGH ON SAMPLE 6
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0427

SUSPENDED SOLIDS	FLAGGED VERY HIGH ON SAMPLE 6 7 9 FLAGGED EXTREMELY HIGH ON SAMPLE 8 RANKING INDICATES RESULTS ARE BIASED HIGH
BIOCHEMICAL DEMAND	FLAGGED LOW ON SAMPLE 3 6 8 RANKING INDICATES RESULTS ARE BIASED LOW
PH	FLAGGED LOW ON SAMPLE 3 7
TOTAL PHOSPHORUS-STP	SATISFACTORY

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0428

SUSPENDED SOLIDS	FLAGGED LOW ON SAMPLE 7 8
BIOCHEMICAL DEMAND	FLAGGED VERY LOW ON SAMPLE 1 FLAGGED LOW ON SAMPLE 4
PH	FLAGGED VERY HIGH ON SAMPLE 4 6 RANKING INDICATES RESULTS ARE BIASED HIGH
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 4 7 FLAGGED EXTREMELY HIGH ON SAMPLE 6 RANKING INDICATES RESULTS ARE BIASED HIGH

YOUR LABORATORY CODE IS W0429

SUSPENDED SOLIDS	FLAGGED HIGH ON SAMPLE 6 FLAGGED VERY HIGH ON SAMPLE 7
BIOCHEMICAL DEMAND	FLAGGED HIGH ON SAMPLE 3 6 FLAGGED VERY HIGH ON SAMPLE 2 8 FLAGGED EXTREMELY HIGH ON SAMPLE 4 7 RANKING INDICATES RESULTS ARE BIASED HIGH
PH	FLAGGED EXTREMELY LOW ON SAMPLE 6 THIS EXTREMELY LOW RESULT SUGGESTS THE MEASUREMENT PROCESS IS OUT OF CONTROL
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 7 FLAGGED VERY HIGH ON SAMPLE 5 8

YOUR LABORATORY CODE IS W0430

SUSPENDED SOLIDS	FLAGGED VERY LOW ON SAMPLE 2 3 4 FLAGGED LOW ON SAMPLE 1 9
BIOCHEMICAL DEMAND	SATISFACTORY
PH	NO RESULTS REPORTED.
TOTAL PHOSPHORUS-STP	NO RESULTS REPORTED.

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0431

SUSPENDED SOLIDS	FLAGGED EXTREMELY HIGH ON SAMPLE 9 THIS EXTREMELY HIGH RESULT SUGGESTS THE MEASUREMENT PROCESS IS OUT OF CONTROL
BIOCHEMICAL DEMAND	SATISFACTORY
PH	FLAGGED VERY LOW ON SAMPLE 6
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0433

SUSPENDED SOLIDS	SATISFACTORY EXCEPT FOR LOW ON SAMPLE 6
BIOCHEMICAL DEMAND	SATISFACTORY
PH	SATISFACTORY EXCEPT FOR LOW ON SAMPLE 6
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 7 FLAGGED EXTREMELY HIGH ON SAMPLE 8

YOUR LABORATORY CODE IS W0439

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 8 FLAGGED VERY LOW ON SAMPLE 6 9 FLAGGED LOW ON SAMPLE 2
BIOCHEMICAL DEMAND	FLAGGED EXTREMELY HIGH ON SAMPLE 1 3
PH	SATISFACTORY EXCEPT FOR LOW ON SAMPLE 1
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 2 4 6 FLAGGED VERY LOW ON SAMPLE 3 FLAGGED EXTREMELY HIGH ON SAMPLE 5 7 8 THESE RESULTS ARE ERRATIC

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0441

SUSPENDED SOLIDS	FLAGGED VERY LOW ON SAMPLE 8
BIOCHEMICAL DEMAND	SATISFACTORY
PH	FLAGGED HIGH ON SAMPLE 7 FLAGGED EXTREMELY HIGH ON SAMPLE 3 4 5 6 RANKING INDICATES RESULTS ARE BIASED HIGH
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0447

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 9 FLAGGED HIGH ON SAMPLE 1 8 FLAGGED VERY HIGH ON SAMPLE 2 4 FLAGGED EXTREMELY HIGH ON SAMPLE 6 THESE RESULTS ARE SLIGHTLY ERRATIC
BIOCHEMICAL DEMAND	SATISFACTORY EXCEPT FOR LOW ON SAMPLE 7
PH	SATISFACTORY EXCEPT FOR LOW ON SAMPLE 7
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0448

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	NO RES LTS REPORTED.
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY HIGH ON SAMPLE 7 THIS EXTREMELY HIGH RESULT SUGGESTS THE MEASUREMENT PROCESS IS OUT OF CONTROL

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0456

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 2 7 8 FLAGGED VERY LOW ON SAMPLE 6 9 FLAGGED LOW ON SAMPLE 1 4 RANKING INDICATES RESULTS ARE BIASED LOW
BIOCHEMICAL DEMAND	FLAGGED EXTREMELY LOW ON SAMPLE 3 4 FLAGGED LOW ON SAMPLE 1 2 6 RANKING INDICATES RESULTS ARE BIASED LOW
PH	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 6
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 1 3 4

YOUR LABORATORY CODE IS W0460

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	SATISFACTORY
PH	FLAGGED HIGH ON SAMPLE 4 6
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0462

SUSPENDED SOLIDS	FLAGGED VERY HIGH ON SAMPLE 6 9 FLAGGED EXTREMELY HIGH ON SAMPLE 2 3 8 RANKING INDICATES RESULTS ARE BIASED HIGH
BIOCHEMICAL DEMAND	SATISFACTORY
PH	FLAGGED HIGH ON SAMPLE 4 FLAGGED VERY HIGH ON SAMPLE 6
TOTAL PHOSPHORUS-STP	SATISFACTORY

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0463

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 7
PH	FLAGGED HIGH ON SAMPLE 4 6
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0464

SUSPENDED SOLIDS	FLAGGED VERY LOW ON SAMPLE 1 6 FLAGGED LOW ON SAMPLE 4
BIOCHEMICAL DEMAND	FLAGGED LOW ON SAMPLE 3 4
PH	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 4
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 2 3 4 6 7 8 RANKING INDICATES RESULTS ARE BIASED LOW

YOUR LABORATORY CODE IS W0468

SUSPENDED SOLIDS	FLAGGED LOW ON SAMPLE 4 8
BIOCHEMICAL DEMAND	FLAGGED LOW ON SAMPLE 5 7 FLAGGED EXTREMELY HIGH ON SAMPLE 6
PH	FLAGGED HIGH ON SAMPLE 3 7 FLAGGED EXTREMELY HIGH ON SAMPLE 4
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 3 4 FLAGGED VERY LOW ON SAMPLE 2

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0469

SUSPENDED SOLIDS	NO RESULTS REPORTED.
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED VERY HIGH ON SAMPLE 4
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 5 FLAGGED EXTREMELY HIGH ON SAMPLE 7 8 RANKING INDICATES RESULTS ARE BIASED HIGH

YOUR LABORATORY CODE IS W0471

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	FLAGGED EXTREMELY LOW ON SAMPLE 6 FLAGGED VERY LOW ON SAMPLE 3 5 7 8 FLAGGED LOW ON SAMPLE 1 RANKING INDICATES RESULTS ARE BIASED LOW
PH	FLAGGED EXTREMELY LOW ON SAMPLE 3 5 6 7 FLAGGED LOW ON SAMPLE 4 FLAGGED EXTREMELY HIGH ON SAMPLE 2 THESE RESULTS ARE SLIGHTLY ERRATIC
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 2 3 4 6 7 8 RANKING INDICATES RESULTS ARE BIASED LOW

YOUR LABORATORY CODE IS W0476

SUSPENDED SOLIDS	FLAGGED LOW ON SAMPLE 4 6 9
BIOCHEMICAL DEMAND	FLAGGED HIGH ON SAMPLE 3 5 7
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	SATISFACTORY

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0477

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 6
PH	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 4
TOTAL PHOSPHORUS-STP	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 8

YOUR LABORATORY CODE IS W0480

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 1 THIS EXTREMELY LOW RESULT SUGGESTS THE MEASUREMENT PROCESS IS OUT OF CONTROL
BIOCHEMICAL DEMAND	SATISFACTORY
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	FLAGGED VERY LOW ON SAMPLE 6

YOUR LABORATORY CODE IS W0482

SUSPENDED SOLIDS	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 6
BIOCHEMICAL DEMAND	SATISFACTORY
PH	FLAGGED VERY LOW ON SAMPLE 6
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 6 7 8 FLAGGED EXTREMELY HIGH ON SAMPLE 2 4 5 THESE RESULTS ARE ERRATIC

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0485

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	FLAGGED EXTREMELY HIGH ON SAMPLE 6 8
PH	NO RESULTS REPORTED.
TOTAL PHOSPHORUS-STP	NO RESULTS REPORTED.

YOUR LABORATORY CODE IS W0489

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	FLAGGED VERY HIGH ON SAMPLE 1 FLAGGED EXTREMELY HIGH ON SAMPLE 5 6 7 8
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 2 3 4 6 7 8 RANKING INDICATES RESULTS ARE BIASED LOW

YOUR LABORATORY CODE IS W0493

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 3 FLAGGED LOW ON SAMPLE 1 FLAGGED HIGH ON SAMPLE 7
BIOCHEMICAL DEMAND	SATISFACTORY
PH	FLAGGED HIGH ON SAMPLE 4 6
TOTAL PHOSPHORUS-STP	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 5

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0497

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	FLAGGED HIGH ON SAMPLE 5 6 7
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 3 6 FLAGGED EXTREMELY HIGH ON SAMPLE 5 7 8 RANKING INDICATES RESULTS ARE BIASED HIGH

YOUR LABORATORY CODE IS W0498

SUSPENDED SOLIDS	FLAGGED VERY LOW ON SAMPLE 2 FLAGGED LOW ON SAMPLE 1 3 4
BIOCHEMICAL DEMAND	SATISFACTORY
PH	FLAGGED EXTREMELY LOW ON SAMPLE 7 FLAGGED VERY LOW ON SAMPLE 3 4 FLAGGED LOW ON SAMPLE 5 RANKING INDICATES RESULTS ARE BIASED LOW
TOTAL PHOSPHORUS-STP	FLAGGED LOW ON SAMPLE 8 FLAGGED HIGH ON SAMPLE 1 FLAGGED EXTREMELY HIGH ON SAMPLE 2 6 7

YOUR LABORATORY CODE IS W0506

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	SATISFACTORY
PH	FLAGGED HIGH ON SAMPLE 2 4 7 8
TOTAL PHOSPHORUS-STP	SATISFACTORY

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0511

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	SATISFACTORY
PH	SATISFACTORY EXCEPT FOR LOW ON SAMPLE 7
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 1 2 4 FLAGGED VERY HIGH ON SAMPLE 6 FLAGGED EXTREMELY HIGH ON SAMPLE 5 7 8 RANKING INDICATES RESULTS ARE BIASED HIGH

YOUR LABORATORY CODE IS W0514

SUSPENDED SOLIDS	FLAGGED EXTREMELY HIGH ON SAMPLE 7 THIS EXTREMELY HIGH RESULT SUGGESTS THE MEASUREMENT PROCESS IS OUT OF CONTROL
BIOCHEMICAL DEMAND	FLAGGED LOW ON SAMPLE 1 2 FLAGGED EXTREMELY HIGH ON SAMPLE 8
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 3 6 FLAGGED LOW ON SAMPLE 1

YOUR LABORATORY CODE IS W0515

SUSPENDED SOLIDS	NO RESULTS REPORTED.
BIOCHEMICAL DEMAND	NO RESULTS REPORTED.
PH	FLAGGED EXTREMELY LOW ON SAMPLE 7 FLAGGED VERY LOW ON SAMPLE 4
TOTAL PHOSPHORUS-STP	SATISFACTORY EXCEPT FOR LOW ON SAMPLE 8

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0516

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	FLAGGED VERY LOW ON SAMPLE 7
PH	FLAGGED HIGH ON SAMPLE 4 7
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0524

SUSPENDED SOLIDS	FLAGGED VERY LOW ON SAMPLE 4 FLAGGED EXTREMELY HIGH ON SAMPLE 7 8 9 THESE RESULTS ARE SLIGHTLY ERRATIC
BIOCHEMICAL DEMAND	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 7
PH	FLAGGED LOW ON SAMPLE 3 4 5 6
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 2 FLAGGED EXTREMELY HIGH ON SAMPLE 5 7 8

YOUR LABORATORY CODE IS W0526

SUSPENDED SOLIDS	FLAGGED VERY HIGH ON SAMPLE 6 FLAGGED EXTREMELY HIGH ON SAMPLE 7
BIOCHEMICAL DEMAND	SATISFACTORY
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	SATISFACTORY

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0528

SUSPENDED SOLIDS	SATISFACTORY
BIOCHEMICAL DEMAND	FLAGGED EXTREMELY LOW ON SAMPLE 1 3 FLAGGED LOW ON SAMPLE 2
PH	FLAGGED HIGH ON SAMPLE 4 FLAGGED VERY HIGH ON SAMPLE 6
TOTAL PHOSPHORUS-STP	FLAGGED EXTREMELY LOW ON SAMPLE 1 4 FLAGGED VERY LOW ON SAMPLE 2 3 6 8 FLAGGED LOW ON SAMPLE 7 RANKING INDICATES RESULTS ARE BIASED LOW

YOUR LABORATORY CODE IS W0529

SUSPENDED SOLIDS	FLAGGED HIGH ON SAMPLE 7 8
BIOCHEMICAL DEMAND	FLAGGED LOW ON SAMPLE 7 FLAGGED HIGH ON SAMPLE 3 8 FLAGGED EXTREMELY HIGH ON SAMPLE 1 4 5 6
PH	FLAGGED HIGH ON SAMPLE 4 6
TOTAL PHOSPHORUS-STP	SATISFACTORY

YOUR LABORATORY CODE IS W0533

SUSPENDED SOLIDS	SATISFACTORY EXCEPT FOR LOW ON SAMPLE 4
BIOCHEMICAL DEMAND	SATISFACTORY
PH	FLAGGED EXTREMELY LOW ON SAMPLE 3 4 5 6 7 FLAGGED VERY HIGH ON SAMPLE 2 THESE RESULTS ARE SLIGHTLY ERRATIC
TOTAL PHOSPHORUS-STP	SATISFACTORY

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0535

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 9 FLAGGED EXTREMELY HIGH ON SAMPLE 7 THESE RESULTS ARE SLIGHTLY ERRATIC
BIOCHEMICAL DEMAND	FLAGGED LOW ON SAMPLE 4 FLAGGED VERY HIGH ON SAMPLE 1 3
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 6

YOUR LABORATORY CODE IS W0538

SUSPENDED SOLIDS	FLAGGED EXTREMELY HIGH ON SAMPLE 7 8 9
BIOCHEMICAL DEMAND	FLAGGED HIGH ON SAMPLE 5 7
PH	FLAGGED VERY LOW ON SAMPLE 3 4 6 FLAGGED LOW ON SAMPLE 5 RANKING INDICATES RESULTS ARE BIASED LOW
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 2 FLAGGED VERY HIGH ON SAMPLE 5

YOUR LABORATORY CODE IS W0542

SUSPENDED SOLIDS	SATISFACTORY EXCEPT FOR LOW ON SAMPLE 6
BIOCHEMICAL DEMAND	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 7
PH	FLAGGED VERY HIGH ON SAMPLE 4
TOTAL PHOSPHORUS-STP	SATISFACTORY

Laboratory Appraisal for MISA Interlaboratory Study

YOUR LABORATORY CODE IS W0551

SUSPENDED SOLIDS	FLAGGED VERY LOW ON SAMPLE 1 FLAGGED LOW ON SAMPLE 7 8
BIOCHEMICAL DEMAND	FLAGGED HIGH ON SAMPLE 3 FLAGGED VERY HIGH ON SAMPLE 7
PH	SATISFACTORY
TOTAL PHOSPHORUS-STP	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 1

YOUR LABORATORY CODE IS W0552

SUSPENDED SOLIDS	FLAGGED EXTREMELY LOW ON SAMPLE 8 THIS EXTREMELY LOW RESULT SUGGESTS THE MEASUREMENT PROCESS IS OUT OF CONTROL
BIOCHEMICAL DEMAND	SATISFACTORY EXCEPT FOR HIGH ON SAMPLE 8
PH	FLAGGED VERY HIGH ON SAMPLE 6
TOTAL PHOSPHORUS-STP	FLAGGED HIGH ON SAMPLE 2 4 FLAGGED EXTREMELY HIGH ON SAMPLE 6 7 RANKING INDICATES RESULTS ARE BIASED HIGH

YOUR LABORATORY CODE IS W0999

SUSPENDED SOLIDS	FLAGGED VERY LOW ON SAMPLE 6 FLAGGED LOW ON SAMPLE 4
BIOCHEMICAL DEMAND	FLAGGED HIGH ON SAMPLE 7 8
PH	FLAGGED VERY LOW ON SAMPLE 4
TOTAL PHOSPHORUS-STP	SATISFACTORY

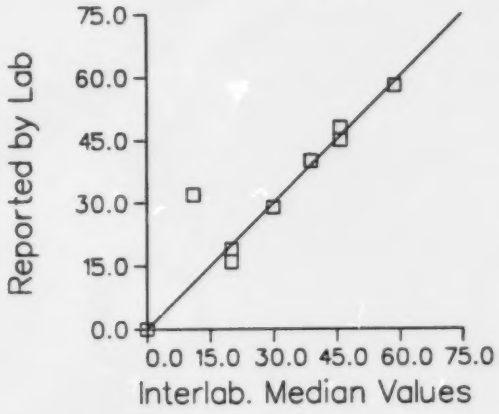
MOE/CAEAL Study, APPENDICES

Appendix 6: GRAPHICS OUTPUT

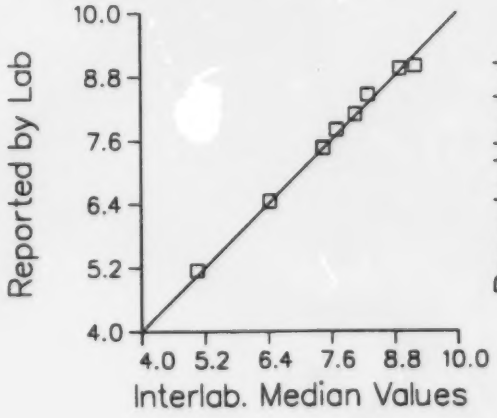
Laboratory: W0009

Comparison of Results Reported versus the Interlaboratory Median values

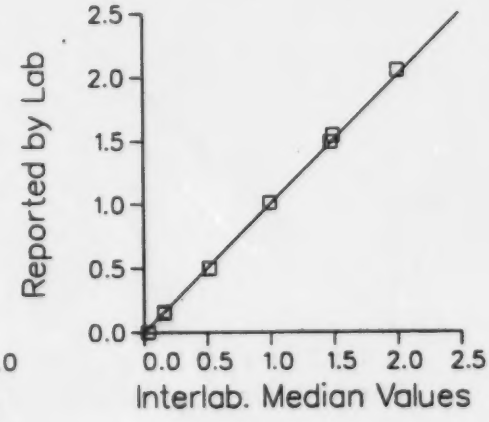
SS ,mg/L



pH ,pH UNITS



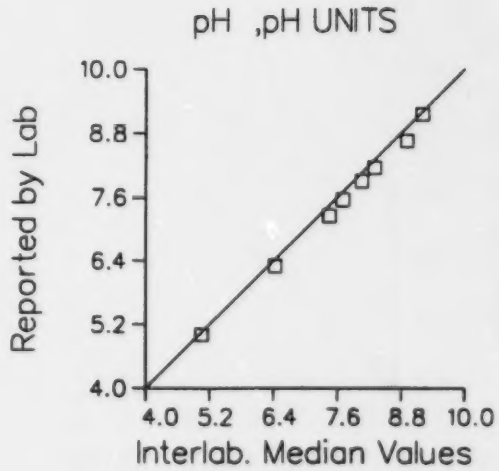
Total P ,mg/L



Lab Code: W0009

Laboratory: W0010

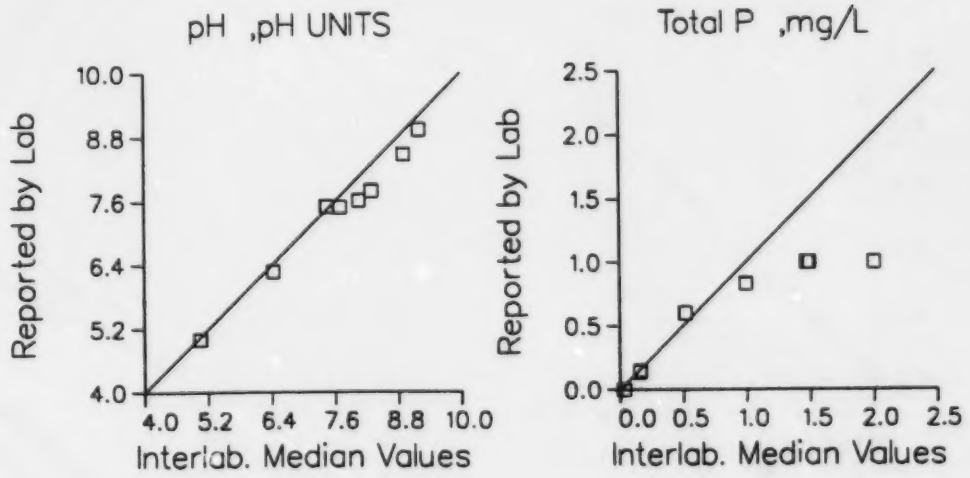
Comparison of Results Reported versus the Interlaboratory Median values



Lab Code: W0010

Laboratory: W0017

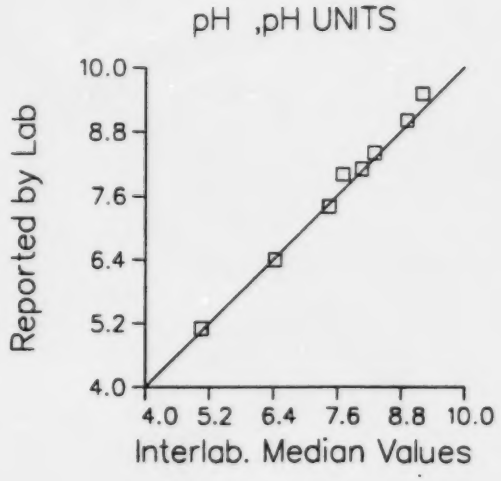
Comparison of Results Reported versus the Interlaboratory Median values



Lab Code: W0017

Laboratory: W0021

Comparison of Results Reported versus
the Interlaboratory Median values

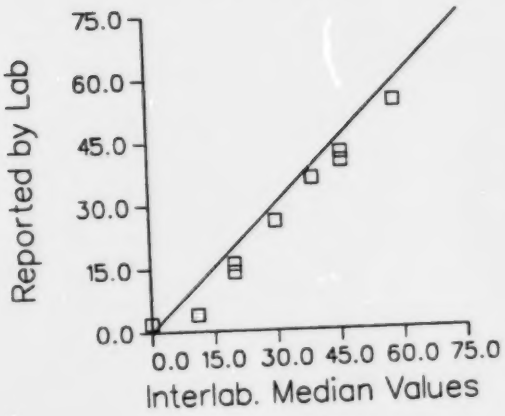


Lab Code: W0021

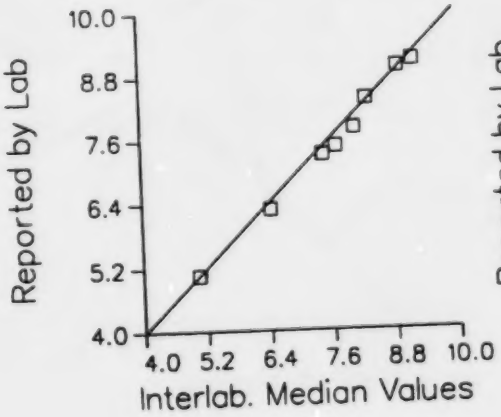
Laboratory: W0023

Comparison of Results Reported versus the Interlaboratory Median values

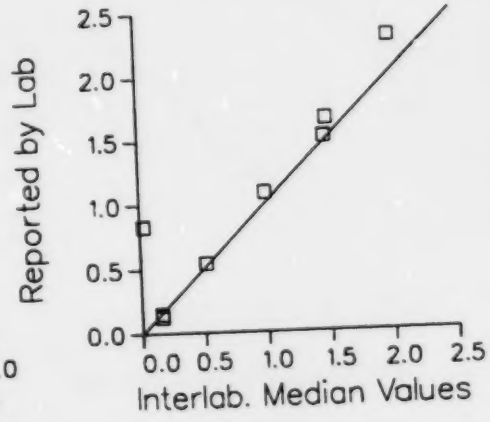
SS ,mg/L



pH ,pH UNITS



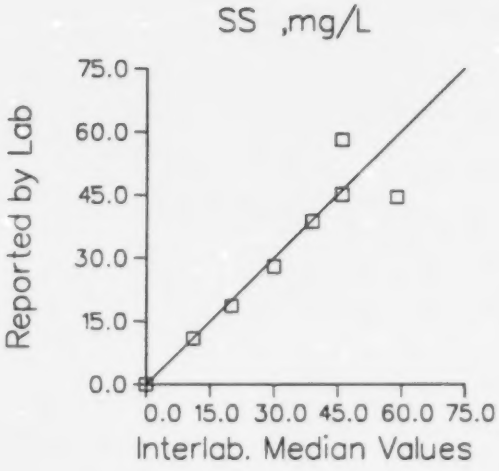
Total P ,mg/L

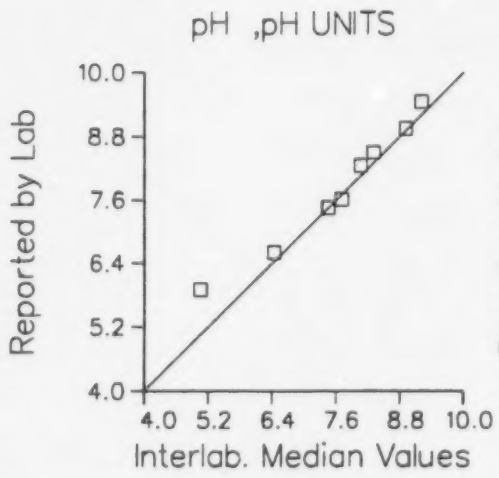


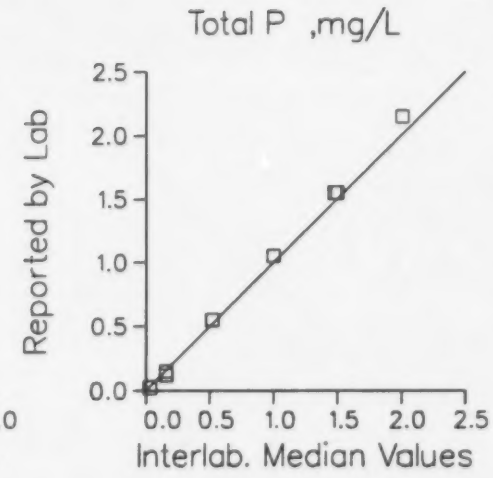
Lab Code: W0023

Laboratory: W0028

Comparison of Results Reported versus the Interlaboratory Median values





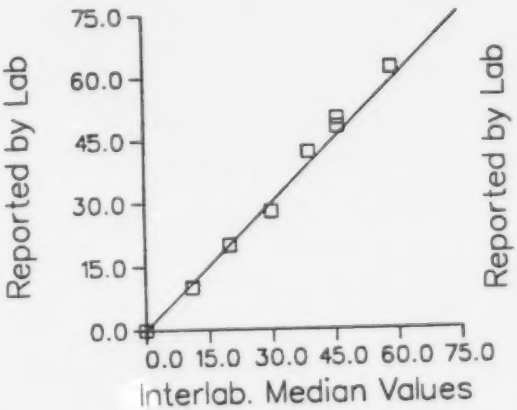


Lab Code: W0028

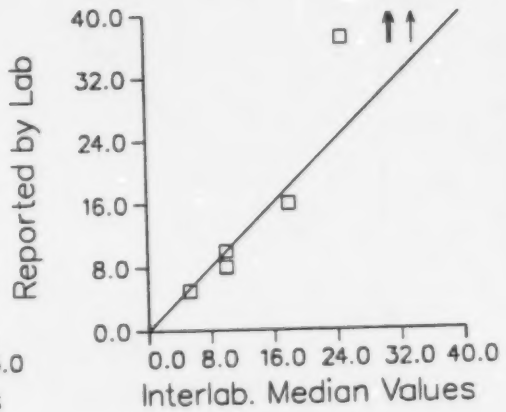
Laboratory: W0042

Comparison of Results Reported versus the Interlaboratory Median values

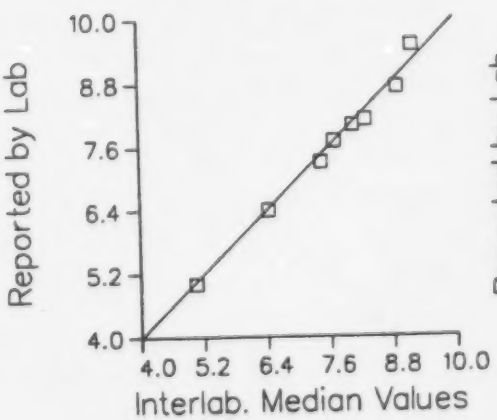
SS ,mg/L



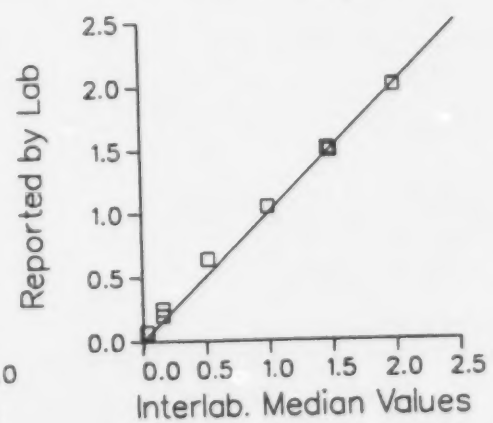
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

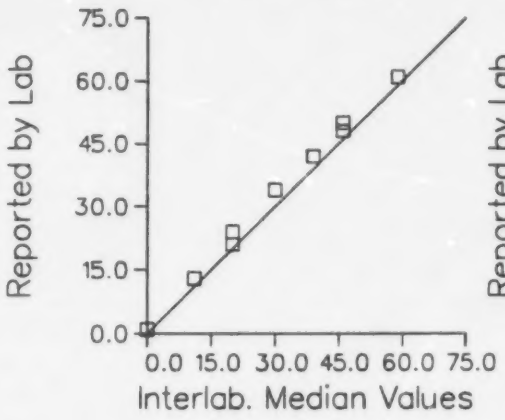


Lab Code: W0042

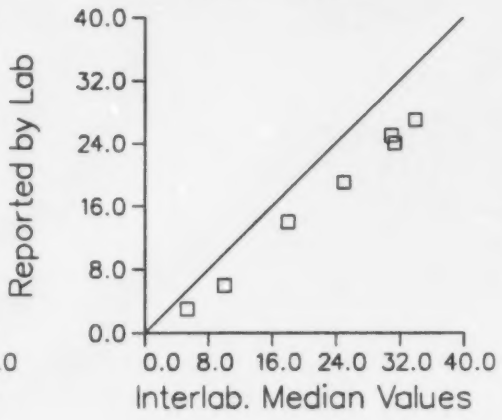
Laboratory: W0072

Comparison of Results Reported versus the Interlaboratory Median values

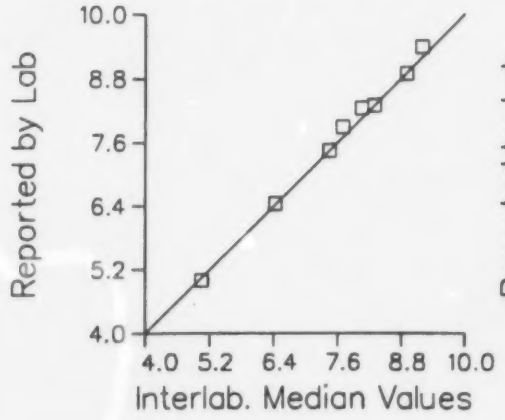
SS ,mg/L



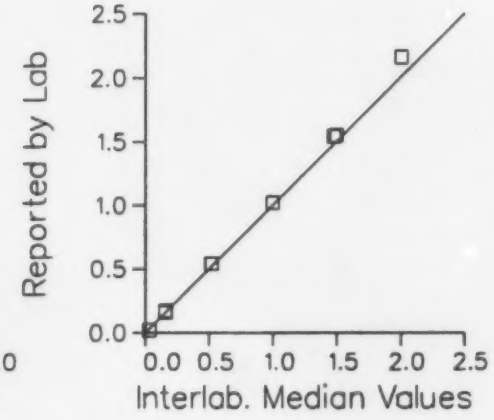
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

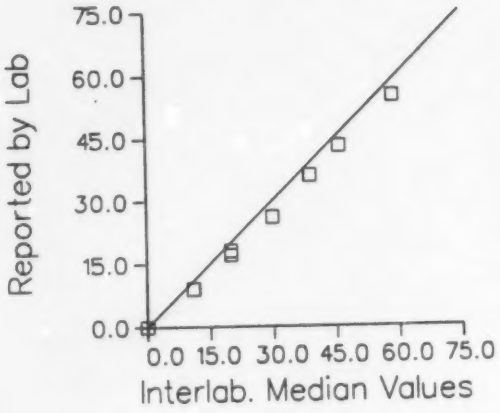


Lab Code: W0072

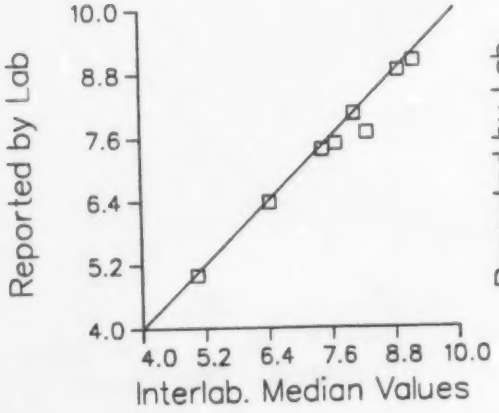
Laboratory: W0127

Comparison of Results Reported versus the Interlaboratory Median values

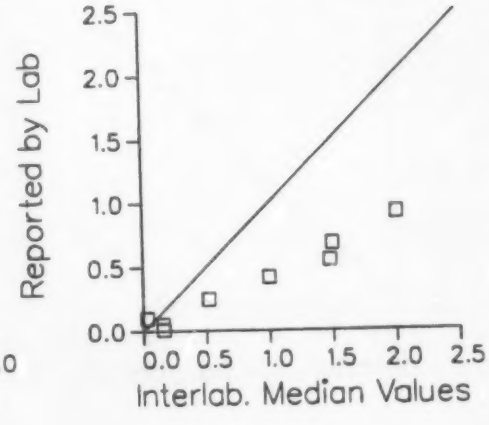
SS ,mg/L



pH ,pH UNITS



Total P ,mg/L

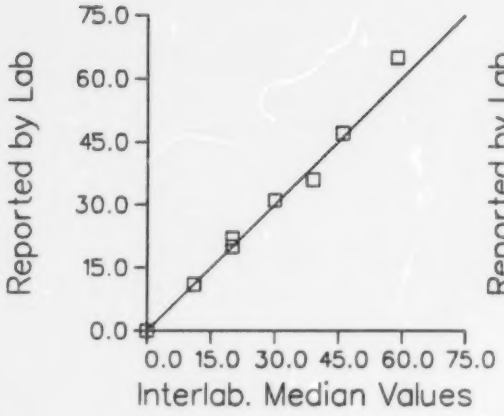


Lab Code: W0127

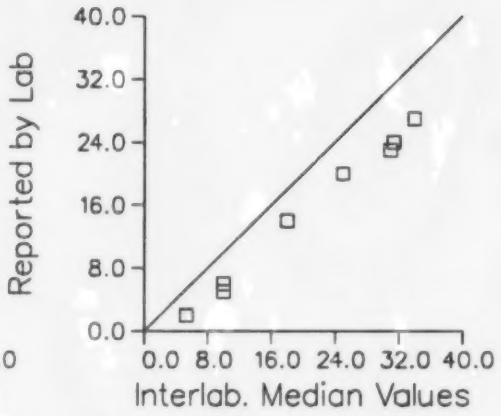
Laboratory: W0147

Comparison of Results Reported versus the Interlaboratory Median values

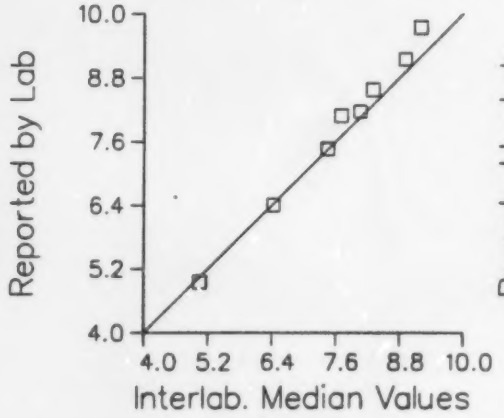
SS ,mg/L



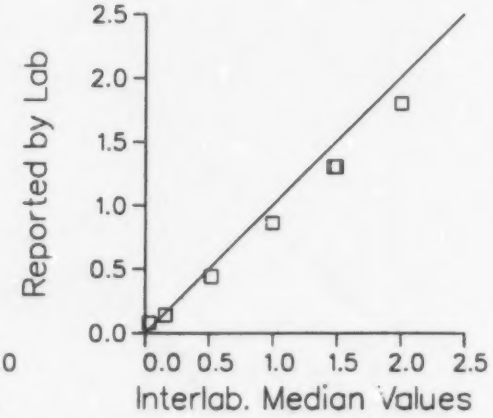
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

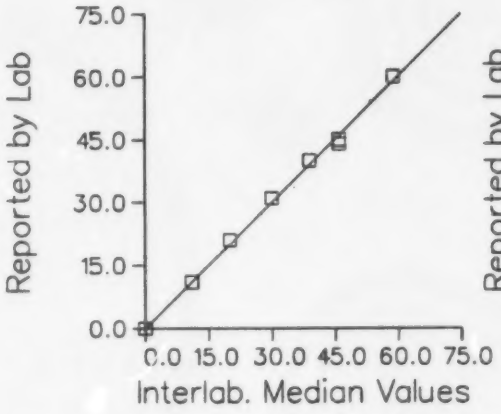


Lab Code: W0147

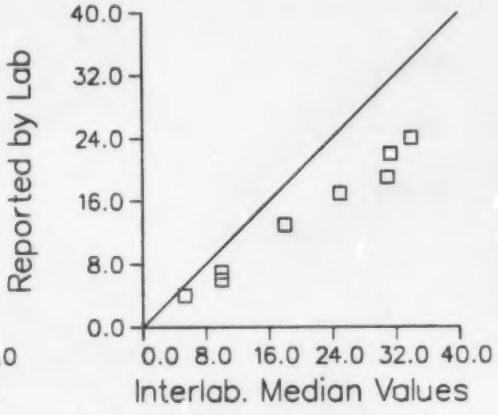
Laboratory: W0148

Comparison of Results Reported versus the Interlaboratory Median values

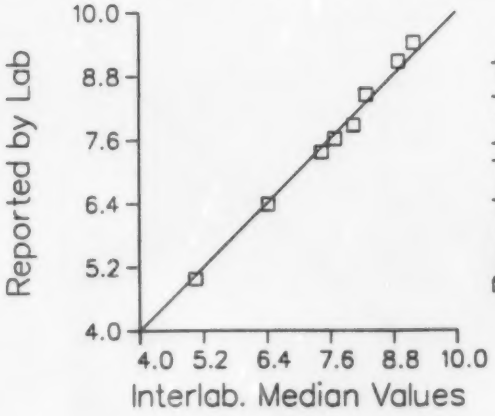
SS ,mg/L



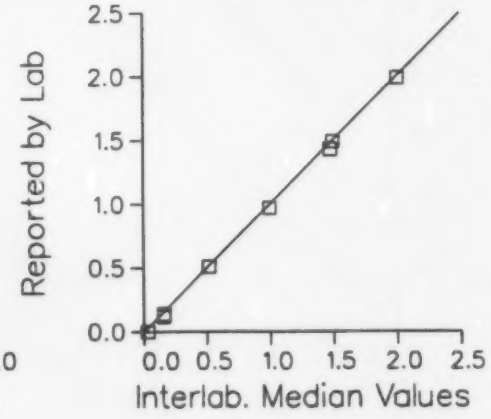
BOD ,mg/L



pH ,pH UNITS



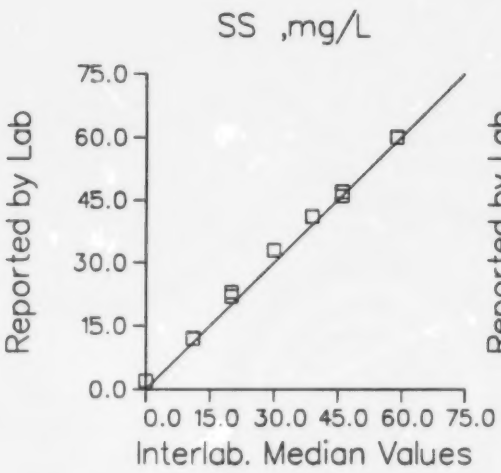
Total P ,mg/L

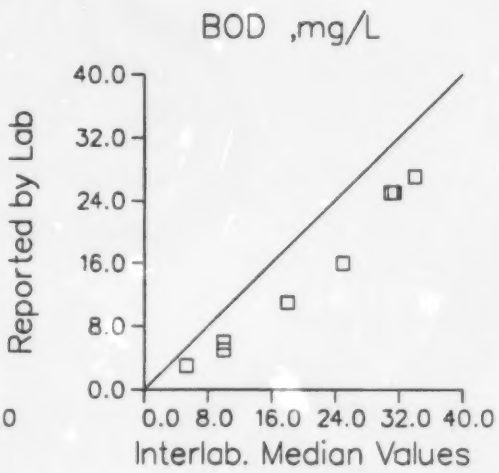


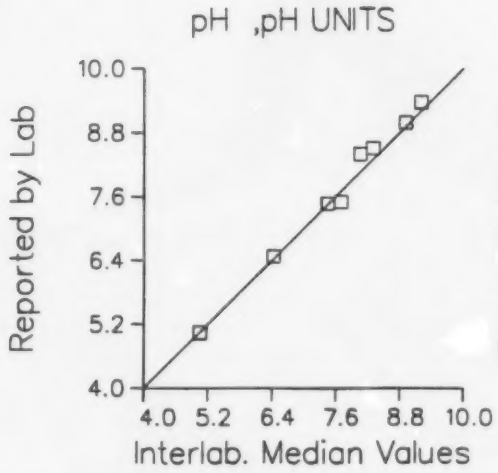
Lab Code: W0148

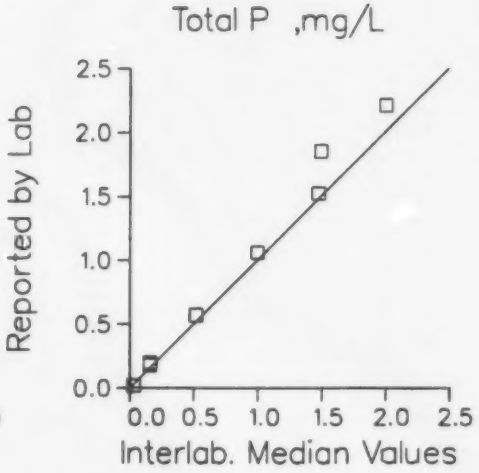
Laboratory: W0149

Comparison of Results Reported versus the Interlaboratory Median values







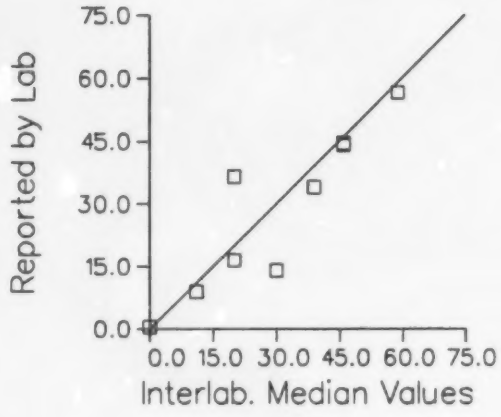


Lab Code: W0149

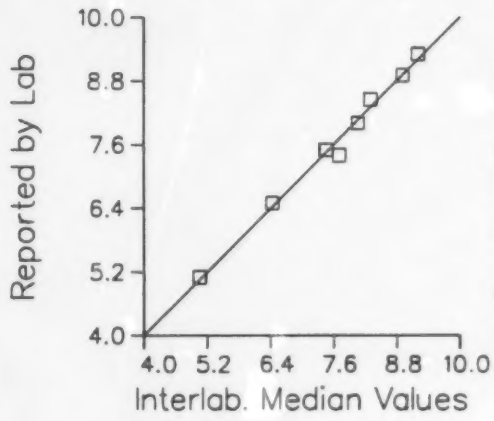
Laboratory: W0179

Comparison of Results Reported versus the Interlaboratory Median values

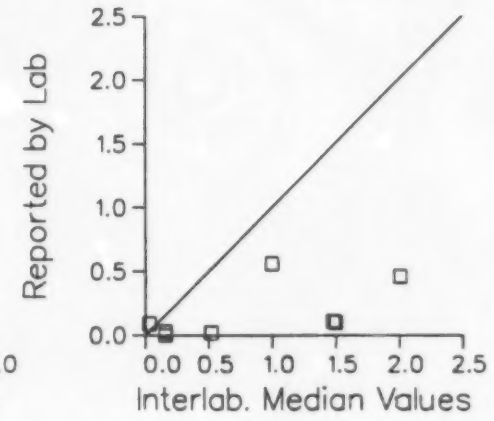
SS ,mg/L



pH ,pH UNITS



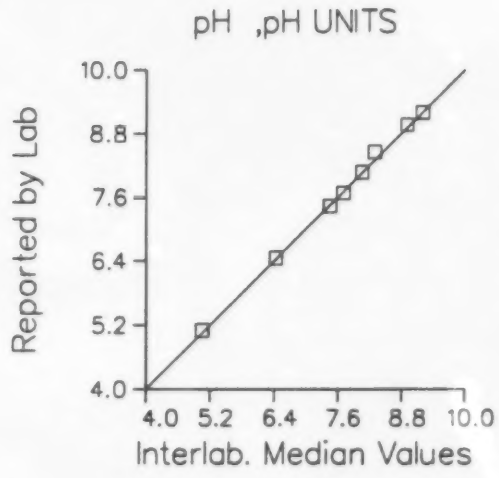
Total P ,mg/L



Lab Code: W0179

Laboratory: W0190

Comparison of Results Reported versus
the Interlaboratory Median values

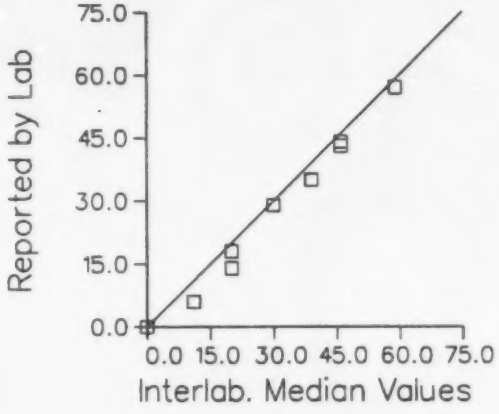


Lab Code: W0190

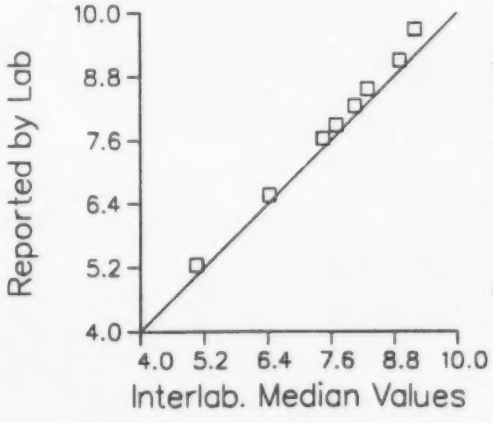
Laboratory: W0198

Comparison of Results Reported versus the Interlaboratory Median values

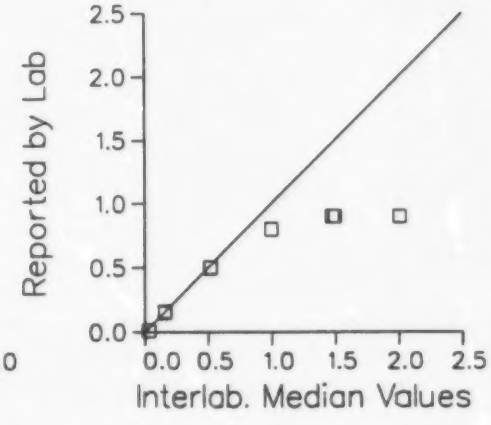
SS ,mg/L



pH ,pH UNITS



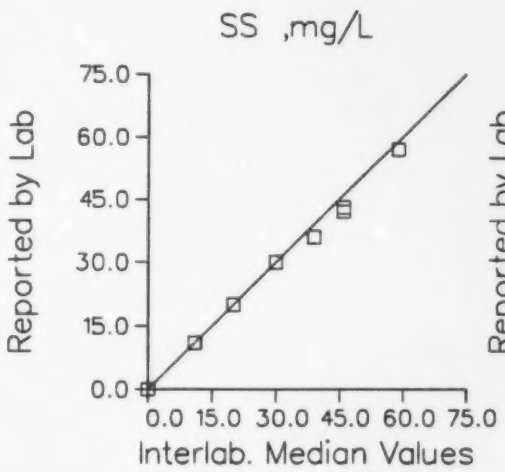
Total P ,mg/L

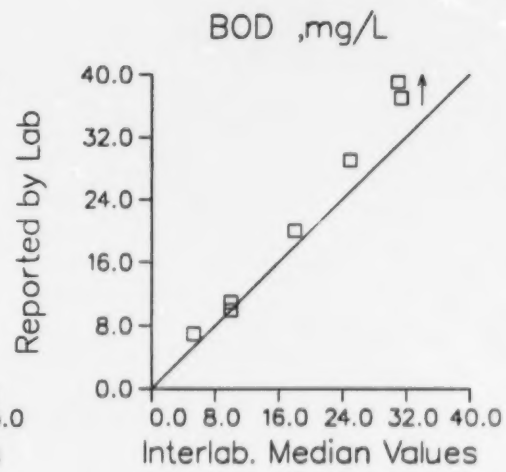


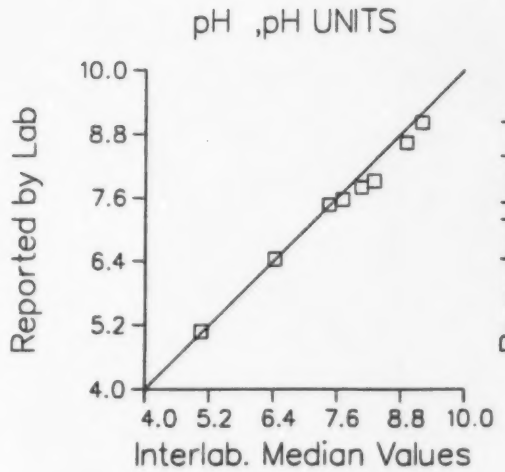
Lab Code: W0198

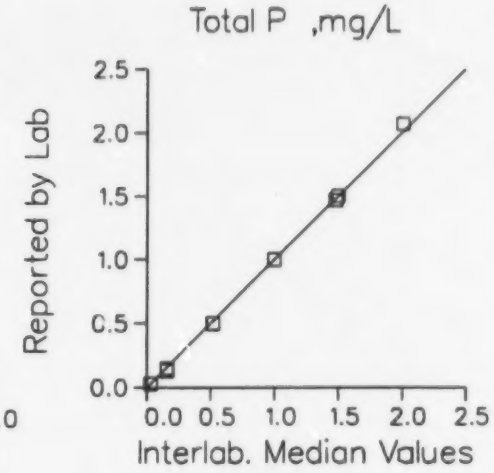
Laboratory: W0211

Comparison of Results Reported versus the Interlaboratory Median values





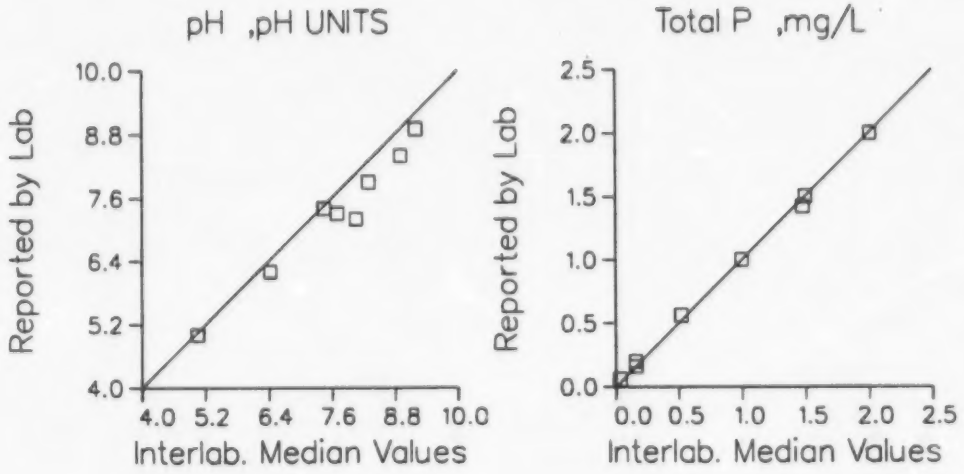




Lab Code: W0211

Laboratory: W0233

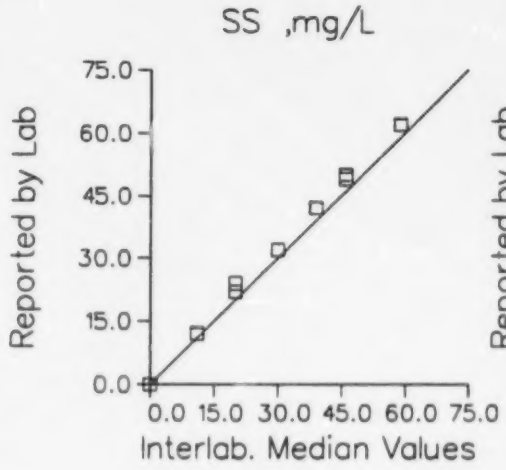
Comparison of Results Reported versus the Interlaboratory Median values

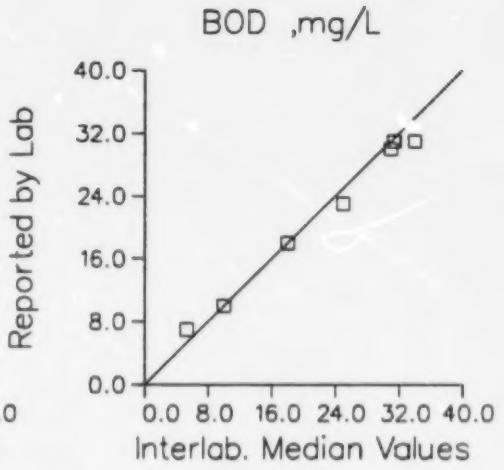


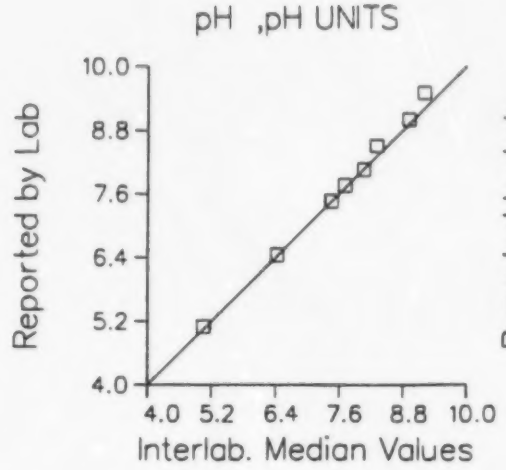
Lab Code: W0233

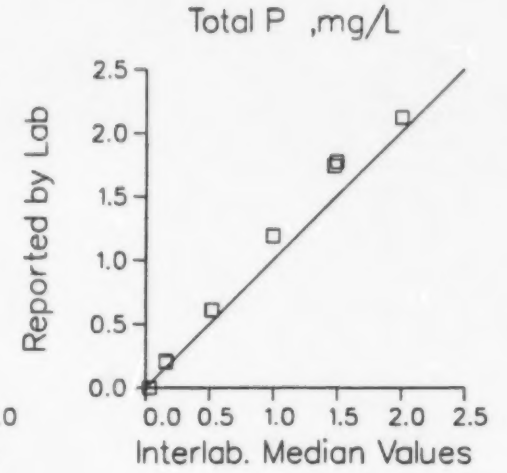
Laboratory: W0238

Comparison of Results Reported versus the Interlaboratory Median values







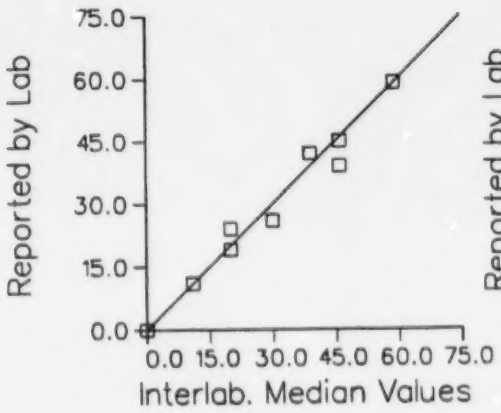


Lab Code: W0238

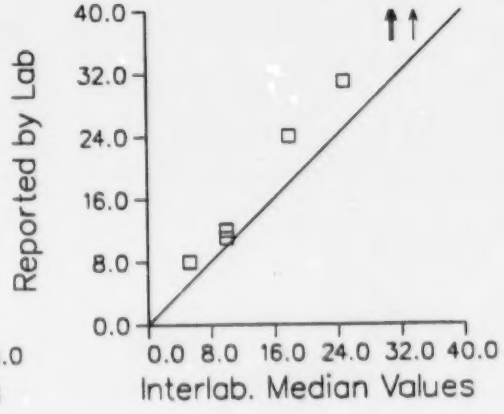
Laboratory: W0239

Comparison of Results Reported versus the Interlaboratory Median values

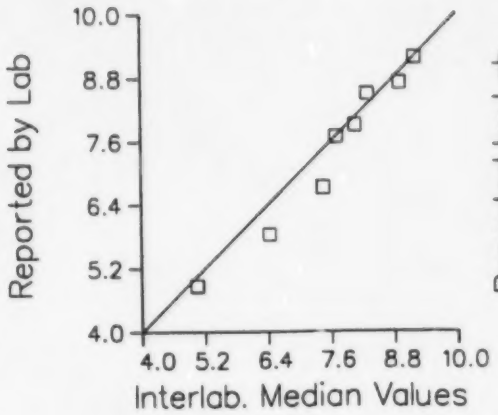
SS ,mg/L



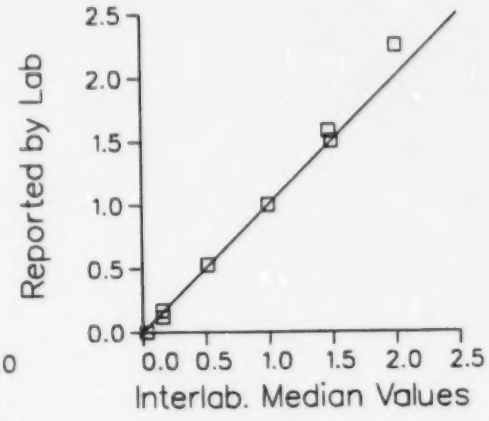
BOD ,mg/L



pH ,pH UNITS



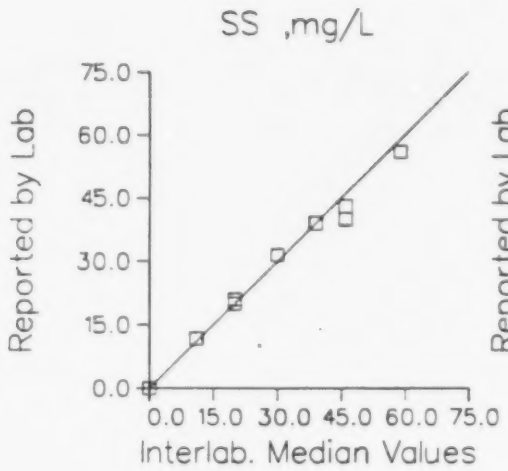
Total P ,mg/L

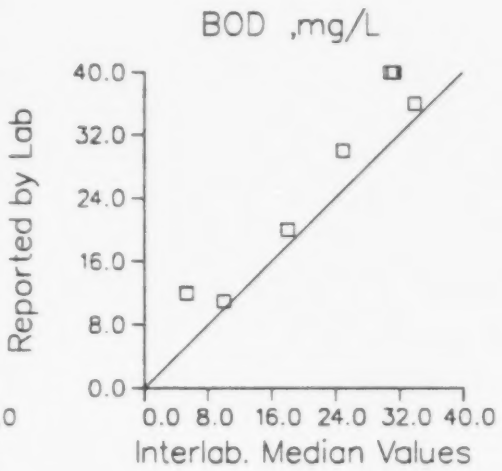


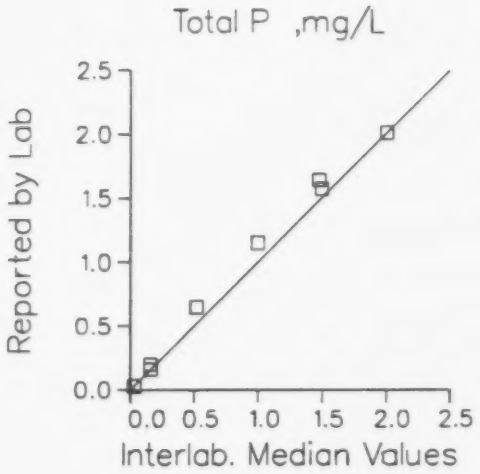
Lab Code: W0239

Laboratory: W0243

Comparison of Results Reported versus the Interlaboratory Median values





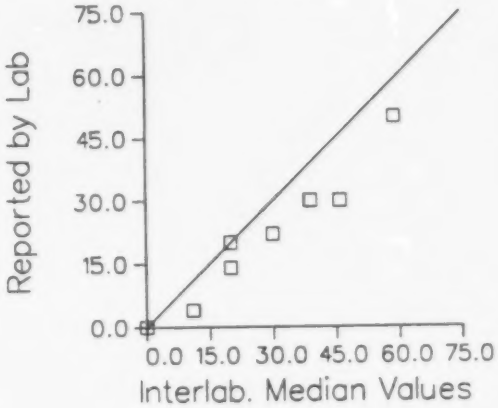


Lab Code: W0243

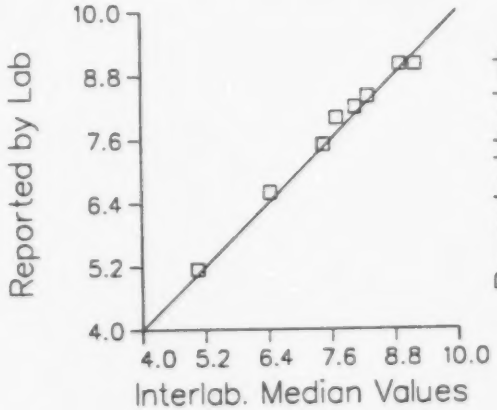
Laboratory: W0247

Comparison of Results Reported versus the Interlaboratory Median values

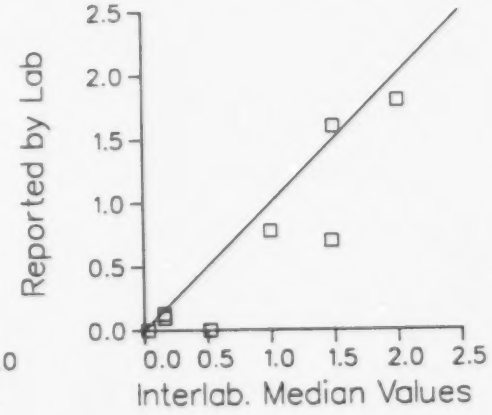
SS ,mg/L



pH ,pH UNITS



Total P ,mg/L

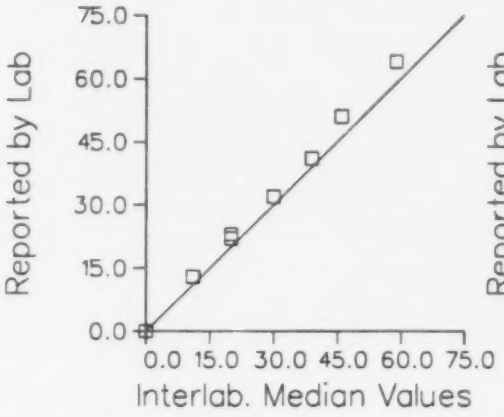


Lab Code: W0247

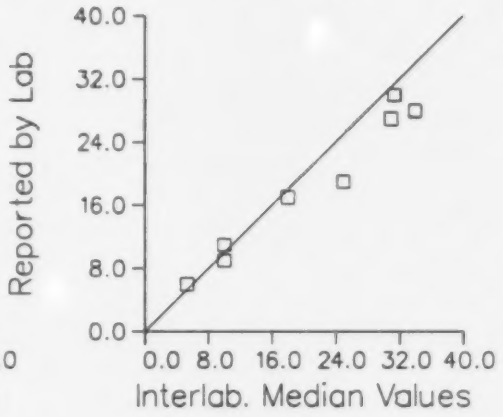
Laboratory: W0248

Comparison of Results Reported versus the Interlaboratory Median values

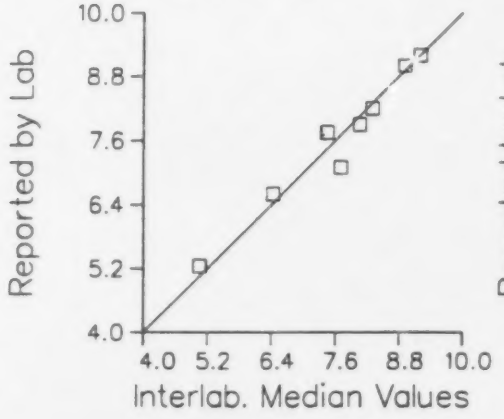
SS ,mg/L



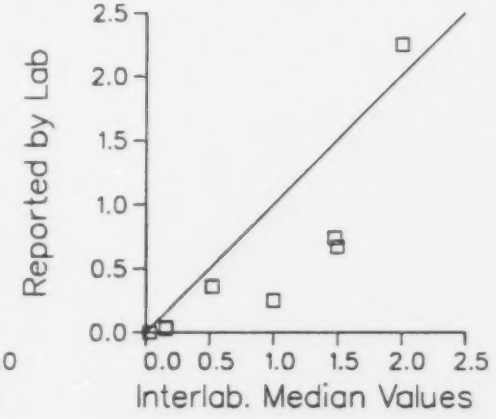
BOD ,mg/L



pH ,pH UNITS



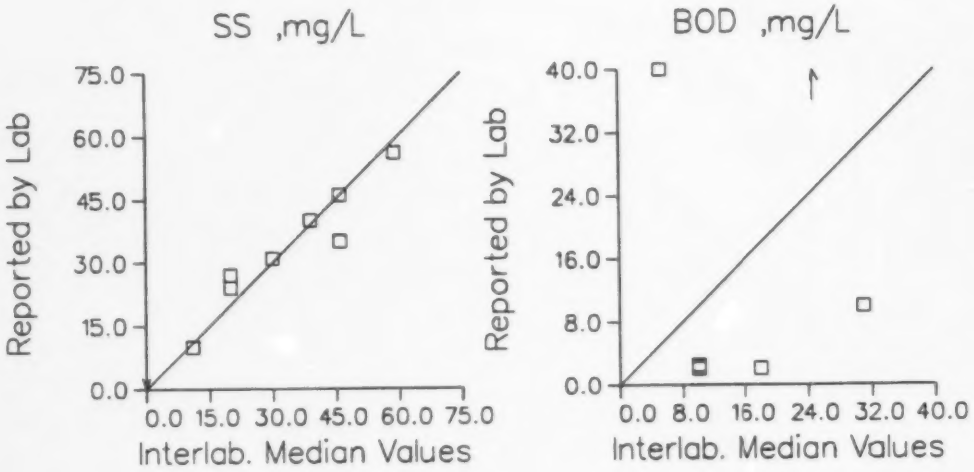
Total P ,mg/L

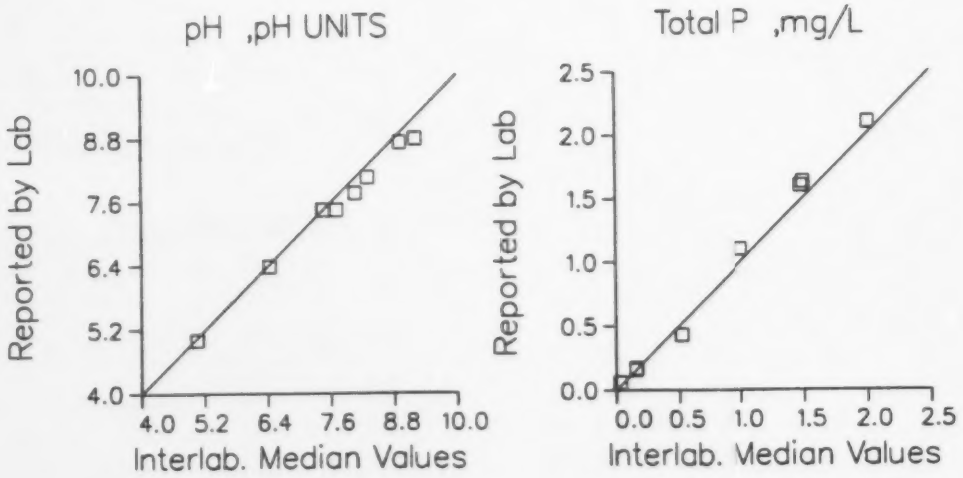


Lab Code: W0248

Laboratory: W0255

Comparison of Results Reported versus the Interlaboratory Median values



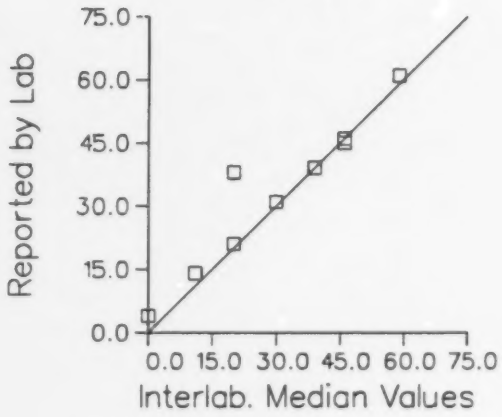


Lab Code: W0255

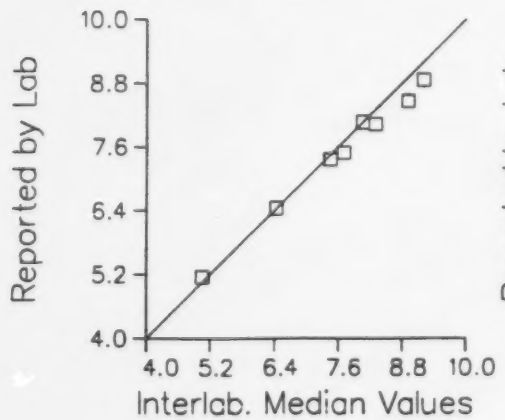
Laboratory: W0266

Comparison of Results Reported versus the Interlaboratory Median values

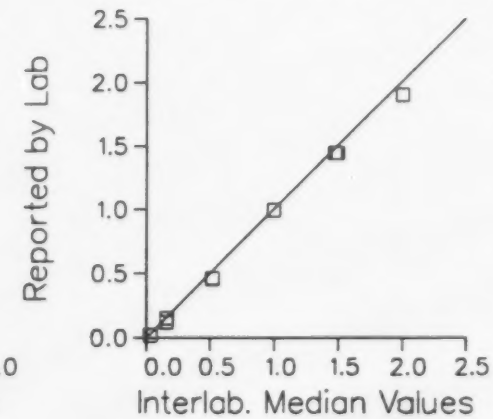
SS ,mg/L



pH ,pH UNITS



Total P ,mg/L

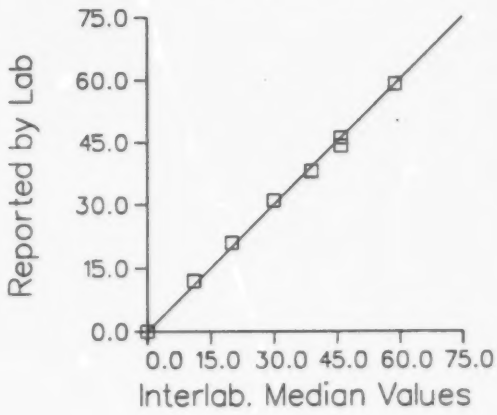


Lab Code: W0266

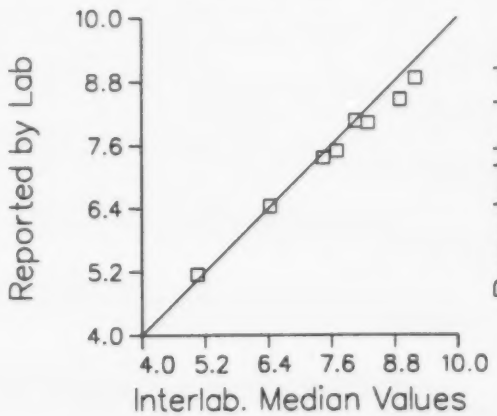
Laboratory: W0305

Comparison of Results Reported versus the Interlaboratory Median values

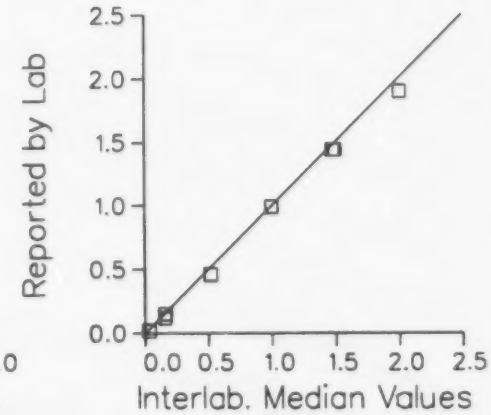
SS ,mg/L



pH ,pH UNITS



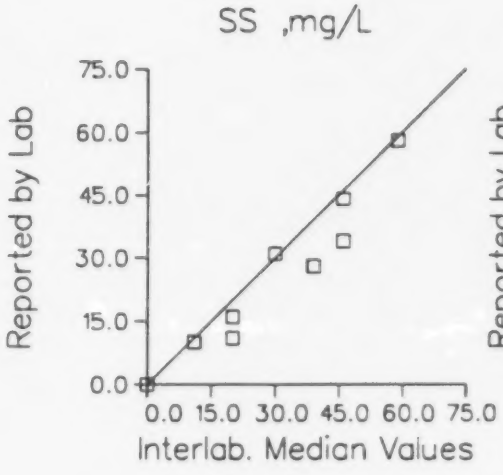
Total P ,mg/L

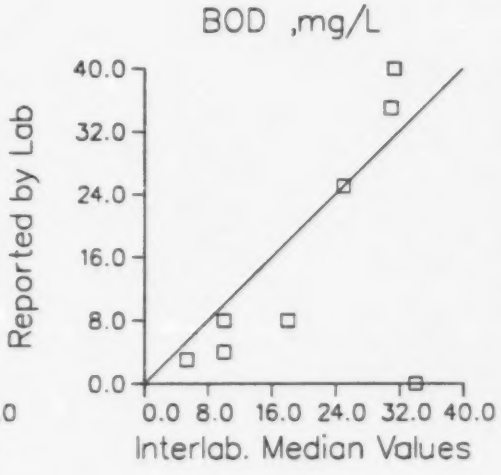


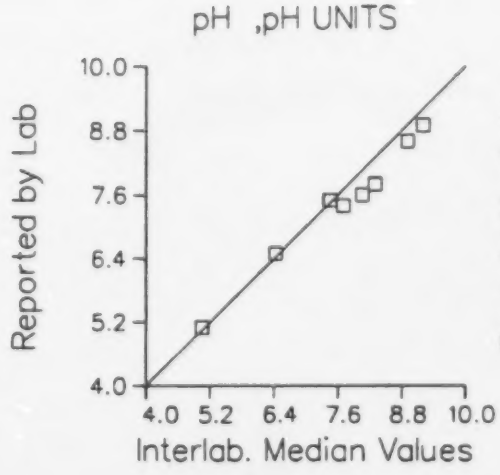
Lab Code: W0305

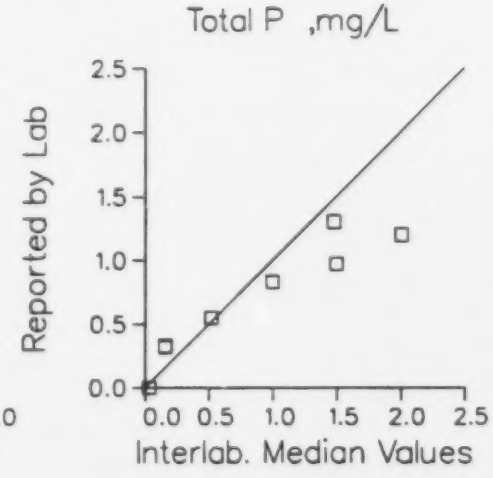
Laboratory: W0335

Comparison of Results Reported versus the Interlaboratory Median values





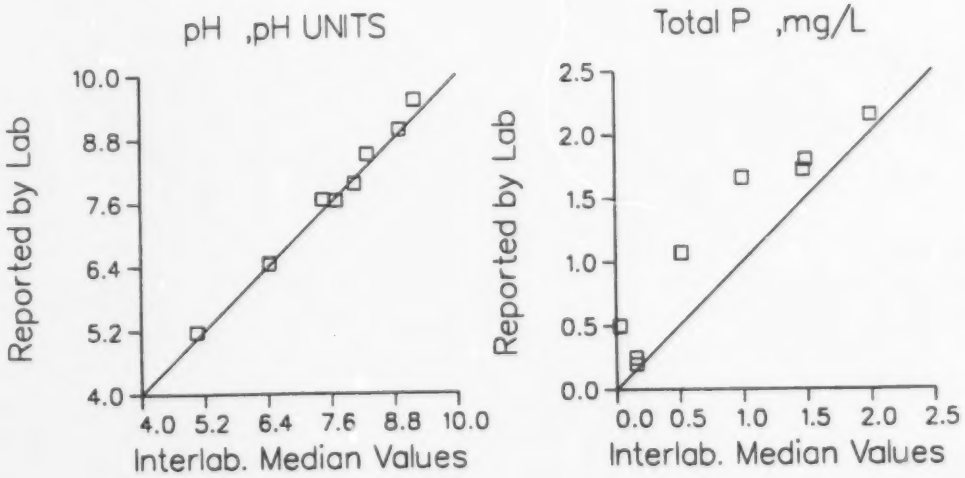




Lab Code: W0335

Laboratory: W0336

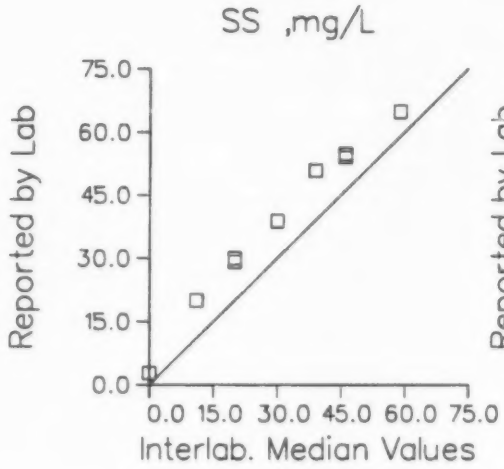
Comparison of Results Reported versus the Interlaboratory Median values

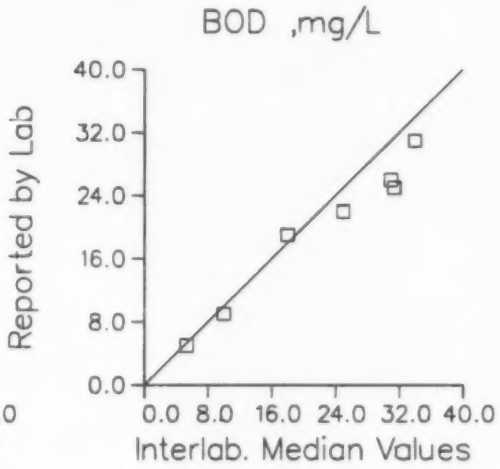


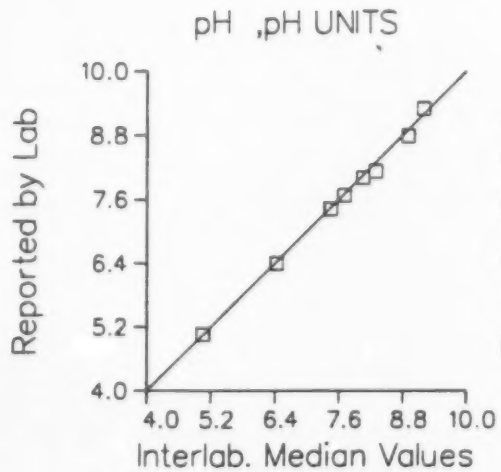
Lab Code: W0336

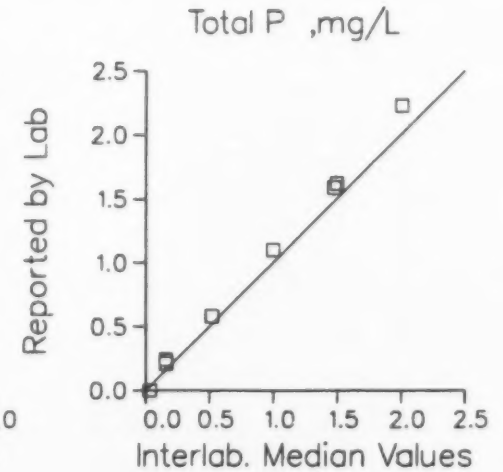
Laboratory: W0337

Comparison of Results Reported versus the Interlaboratory Median values





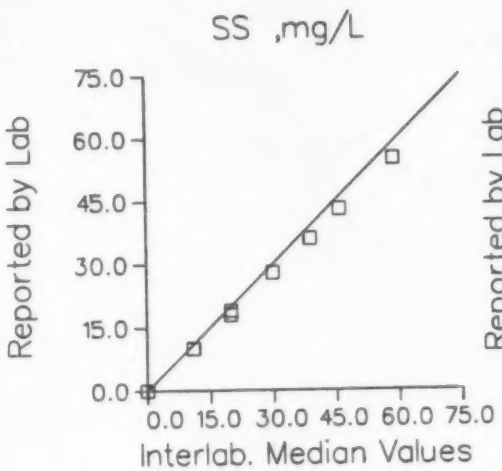


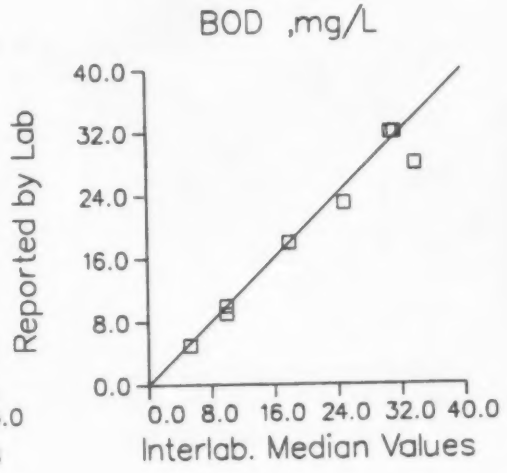


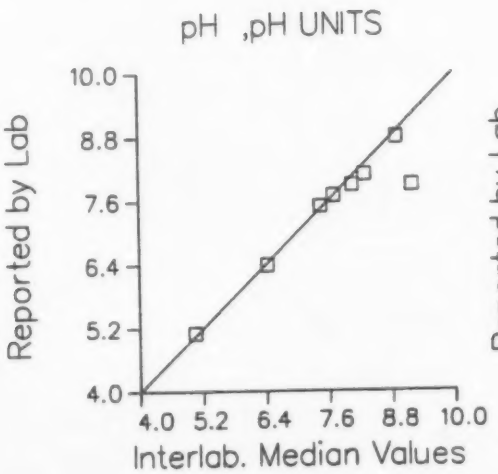
Lab Code: W0337

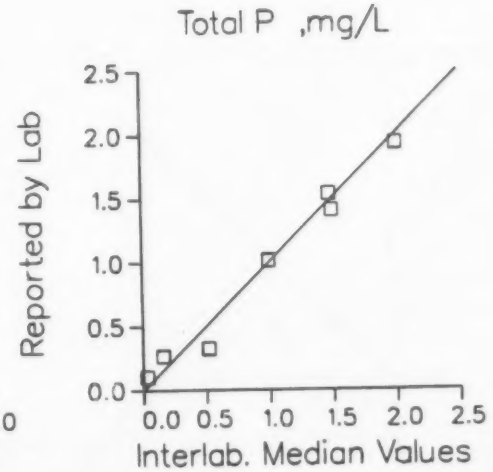
Laboratory: W0364

Comparison of Results Reported versus the Interlaboratory Median values







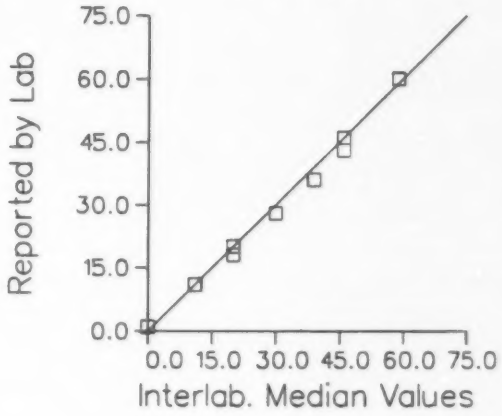


Lab Code: W0364

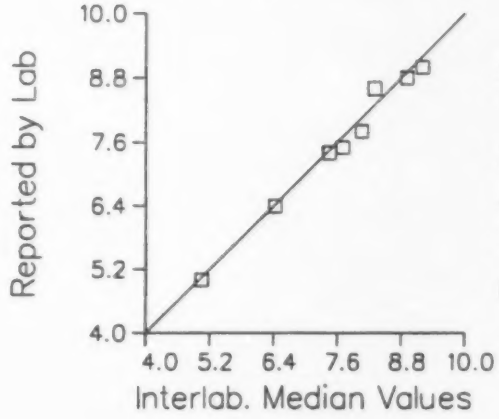
Laboratory: W0370

Comparison of Results Reported versus the Interlaboratory Median values

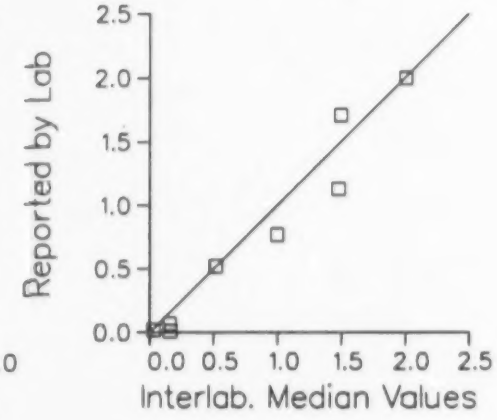
SS ,mg/L



pH ,pH UNITS



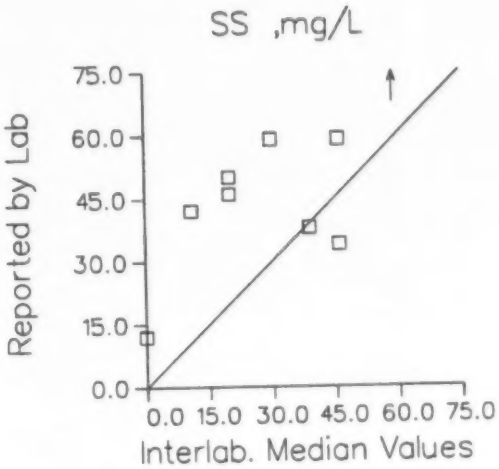
Total P ,mg/L

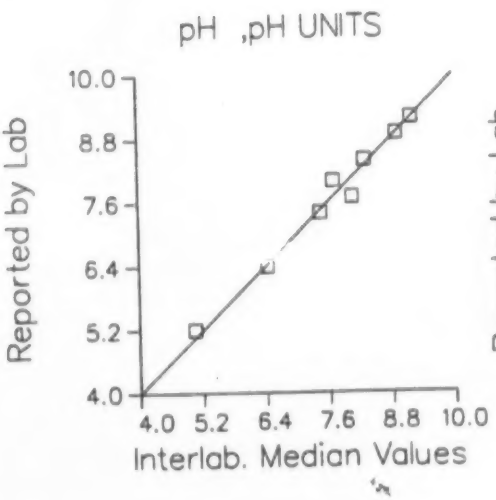


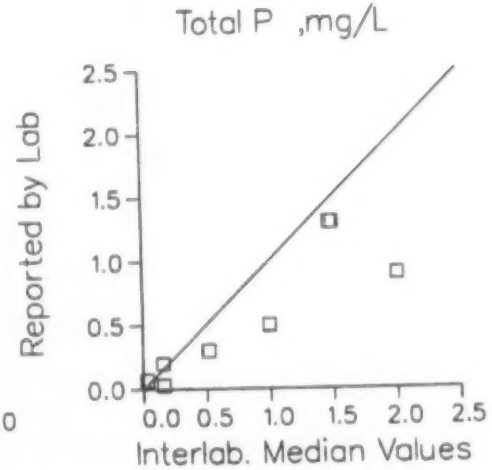
Lab Code: W0370

Laboratory: W0377

Comparison of Results Reported versus the Interlaboratory Median values



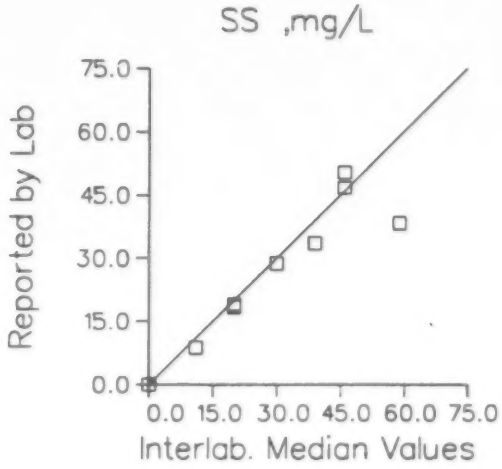


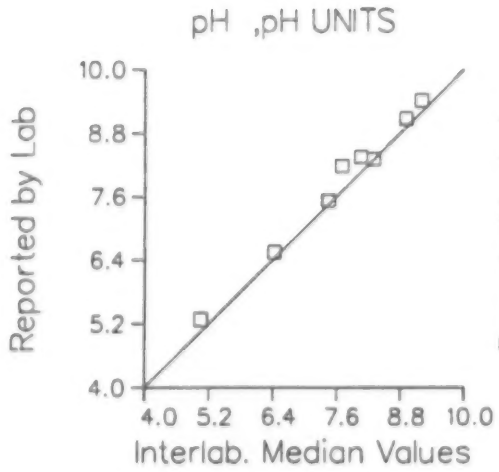


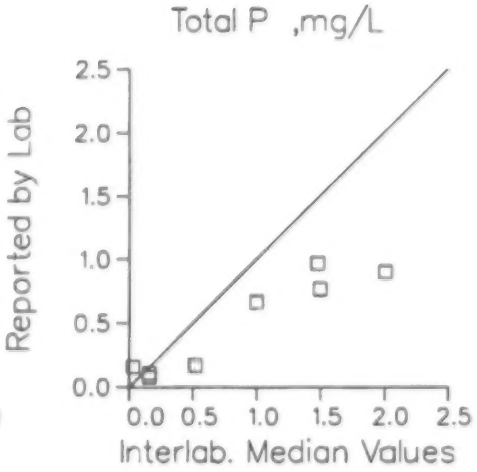
Lab Code: W0377

Laboratory: W0380

Comparison of Results Reported versus the Interlaboratory Median values



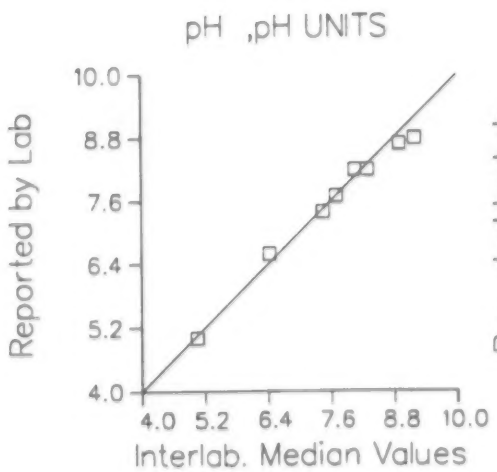


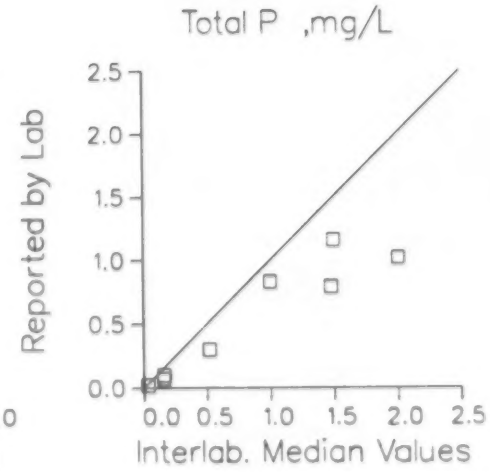


Lab Code: W0380

Laboratory: W0382

Comparison of Results Reported versus
the Interlaboratory Median values

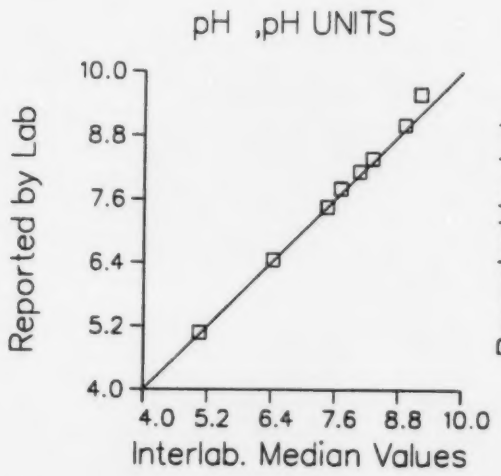


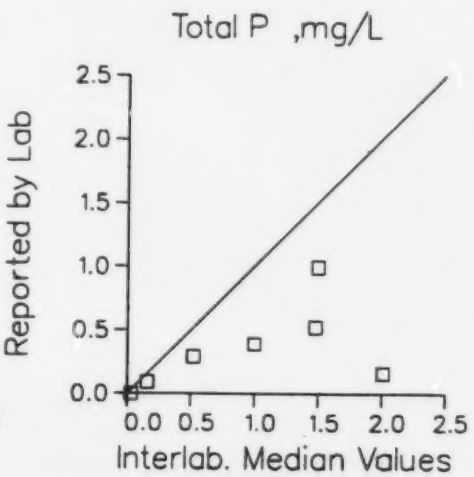


Lab Code: W0382

Laboratory: W0389

Comparison of Results Reported versus
the Interlaboratory Median values

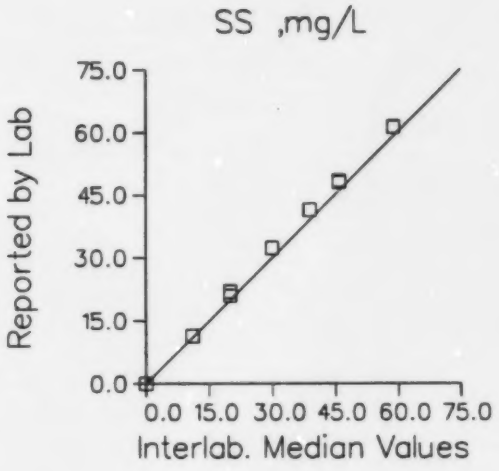




Lab Code: W0389

Laboratory: W0390

Comparison of Results Reported versus the Interlaboratory Median values

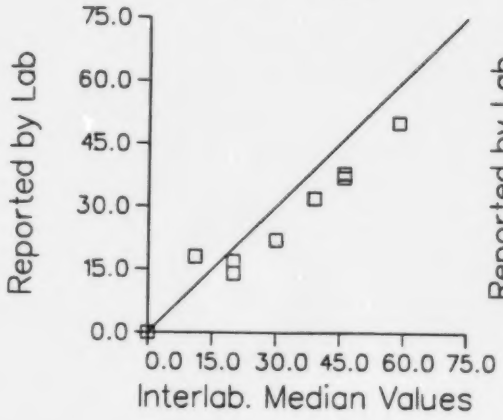


Lab Code: W0390

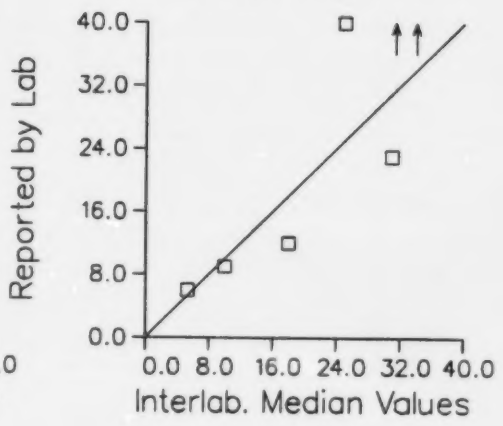
Laboratory: W0404

Comparison of Results Reported versus the Interlaboratory Median values

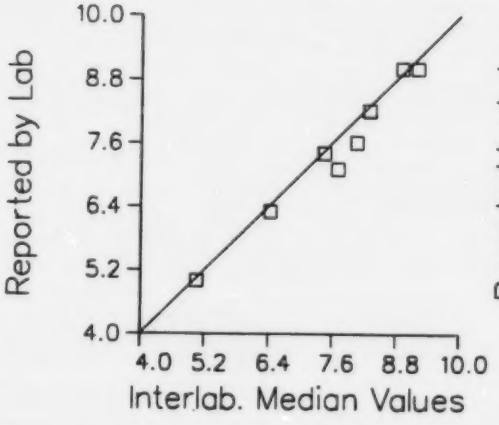
SS ,mg/L



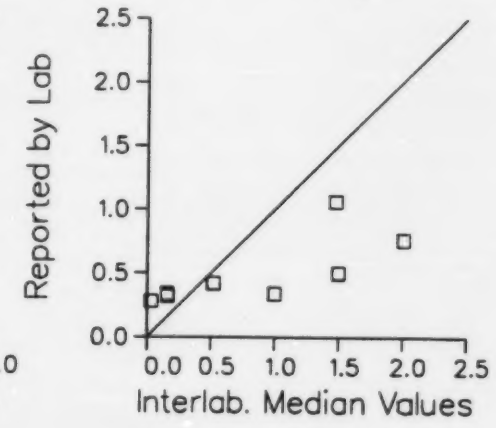
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

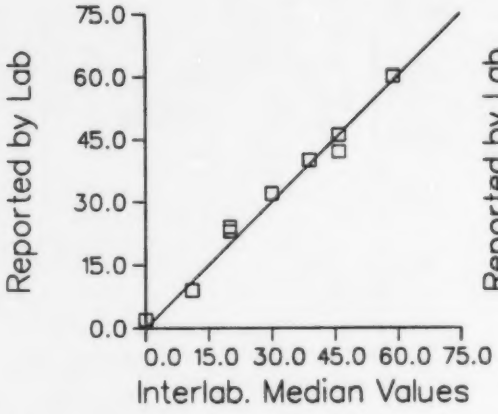


Lab Code: W0404

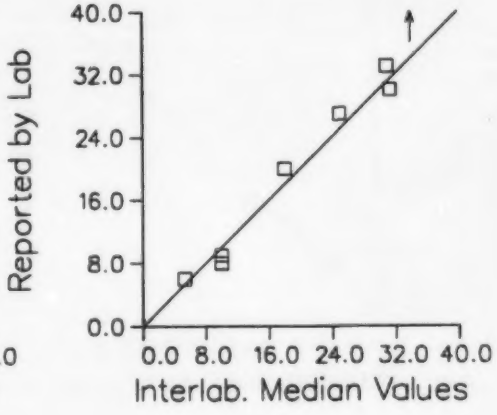
Laboratory: W0417

Comparison of Results Reported versus the Interlaboratory Median values

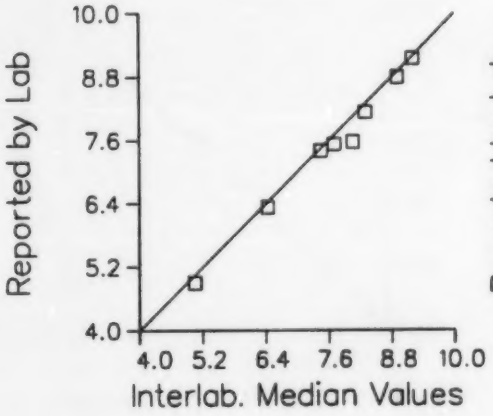
SS ,mg/L



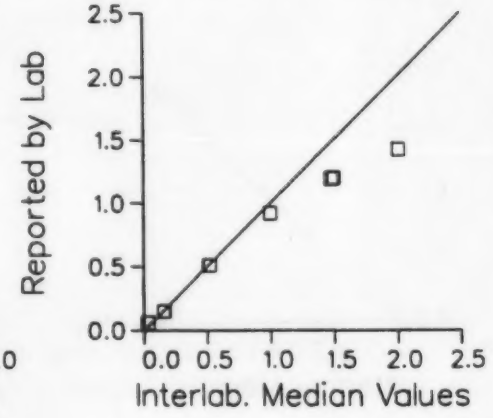
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

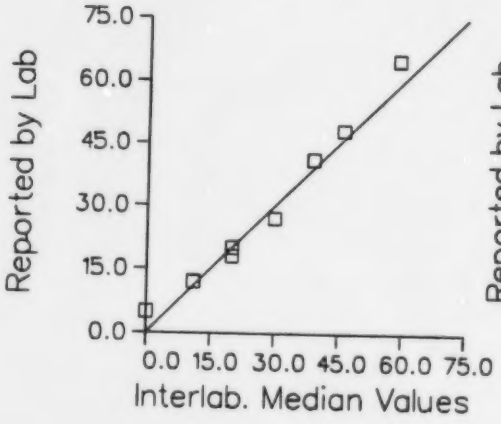


Lab Code: W0417

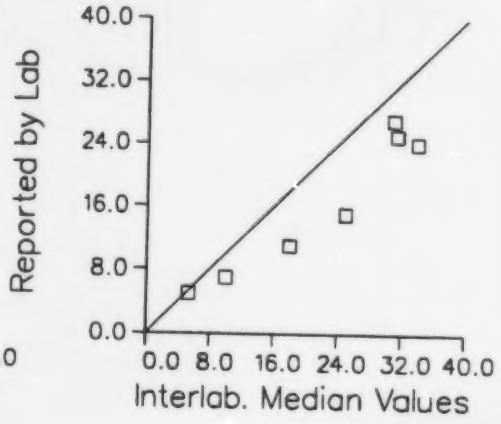
Laboratory: W0418

Comparison of Results Reported versus the Interlaboratory Median values

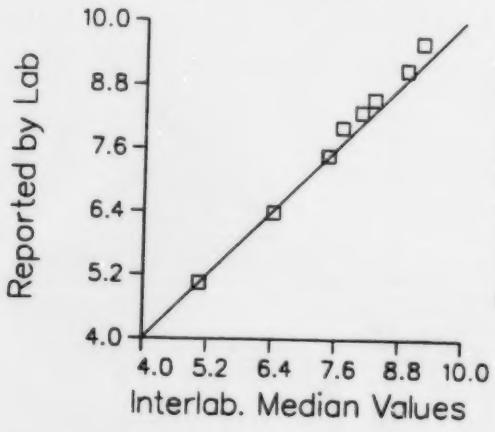
SS ,mg/L



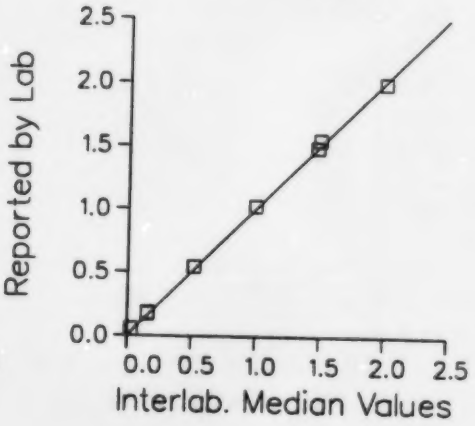
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

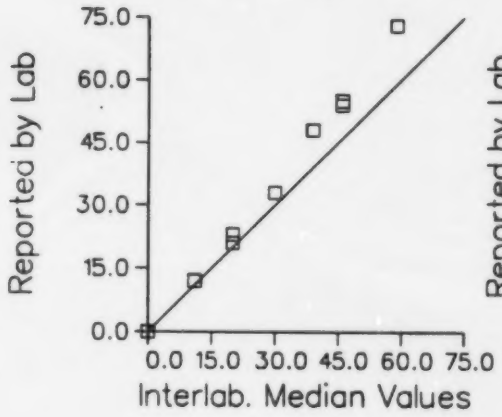


Lab Code: W0418

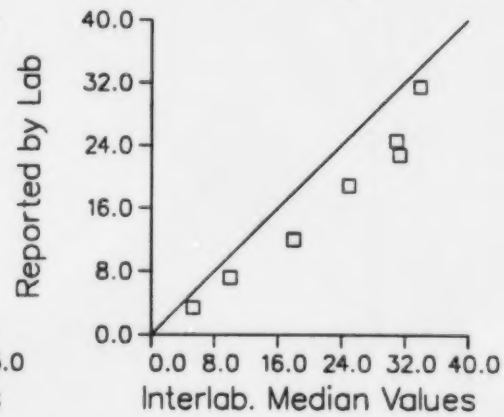
Laboratory: W0427

Comparison of Results Reported versus the Interlaboratory Median values

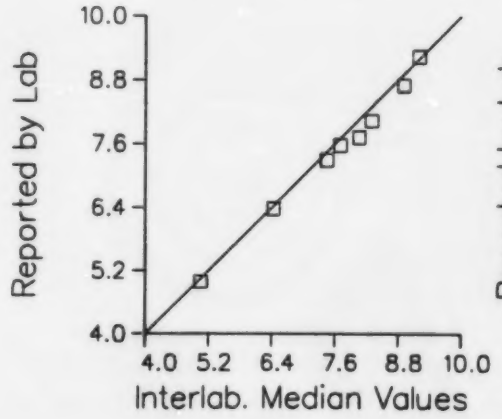
SS ,mg/L



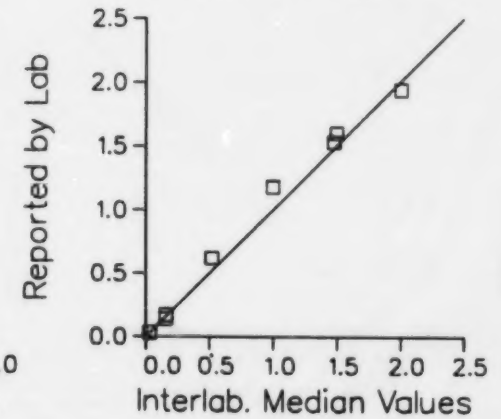
BOD ,mg/L



pH ,pH UNITS



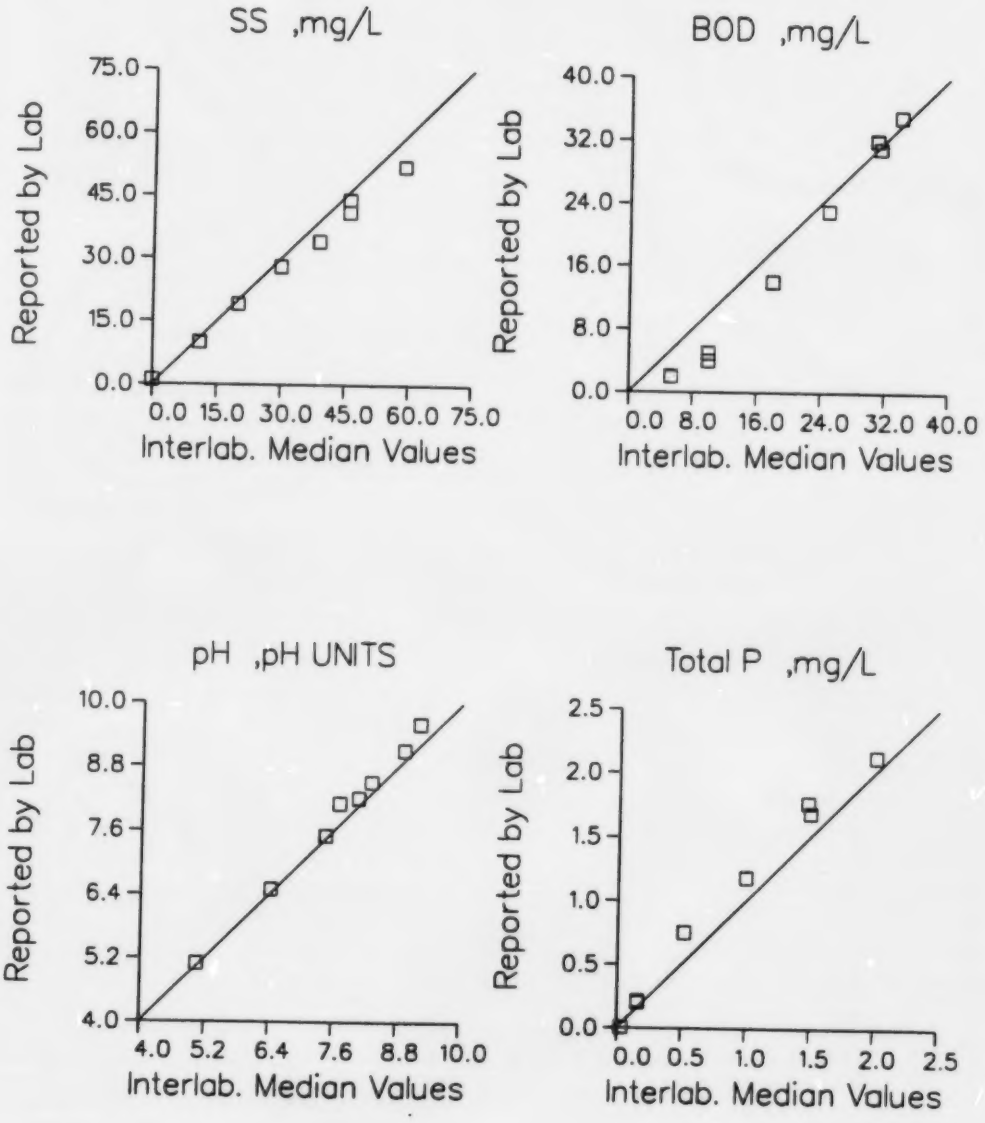
Total P ,mg/L



Lab Code: W0427

Laboratory: W0428

Comparison of Results Reported versus the Interlaboratory Median values

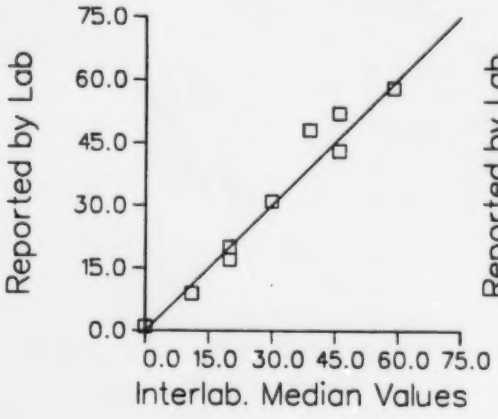


Lab Code: W0428

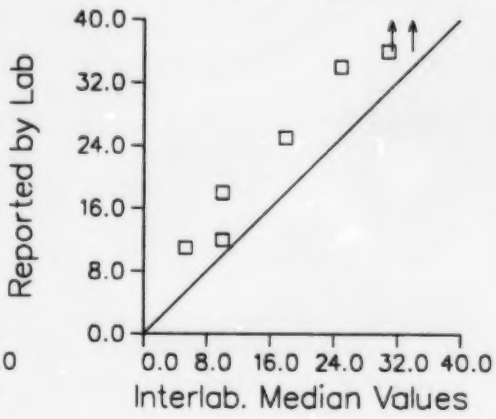
Laboratory: W0429

Comparison of Results Reported versus the Interlaboratory Median values

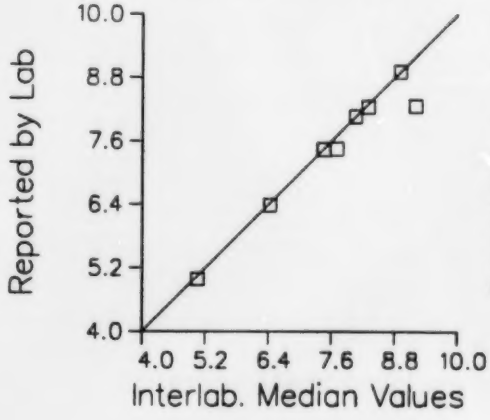
SS ,mg/L



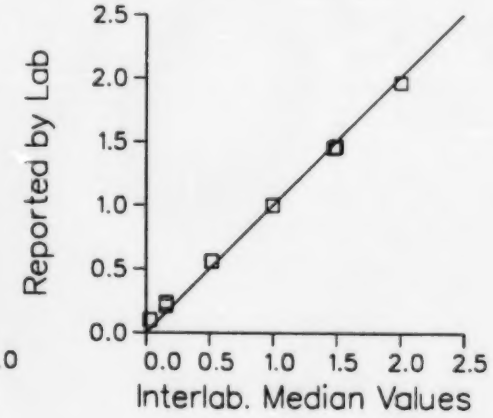
BOD ,mg/L



pH ,pH UNITS



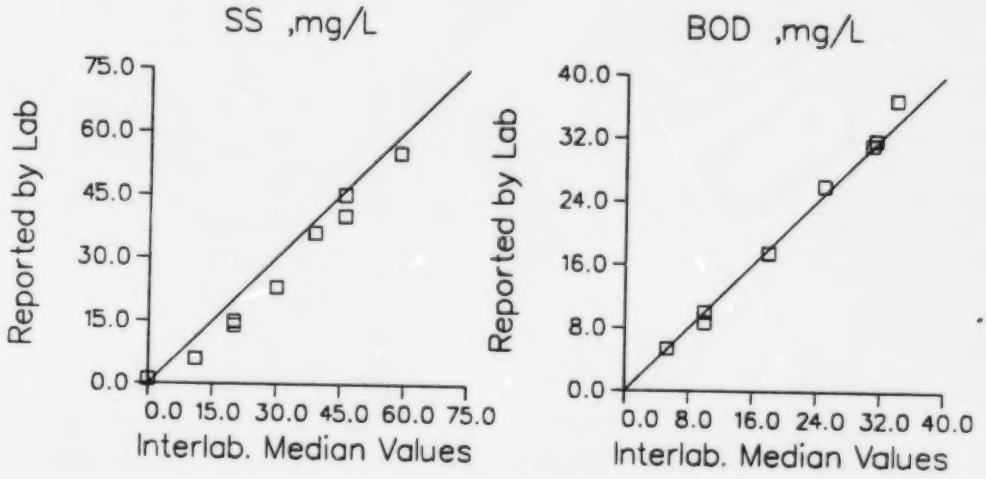
Total P ,mg/L



Lab Code: W0429

Laboratory: W0430

Comparison of Results Reported versus the Interlaboratory Median values

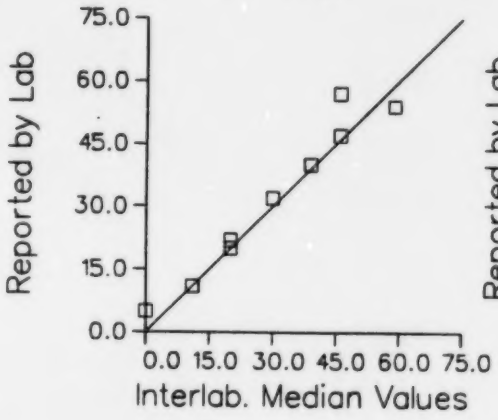


Lab Code: W0430

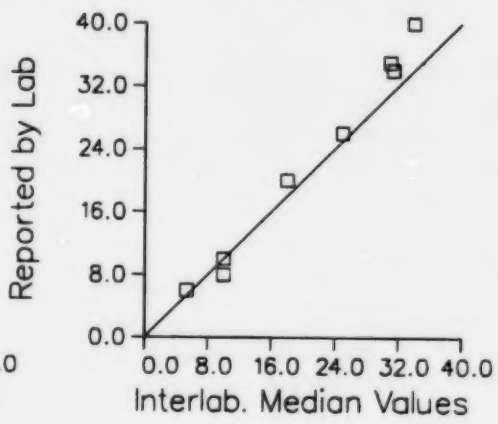
Laboratory: W0431

Comparison of Results Reported versus the Interlaboratory Median values

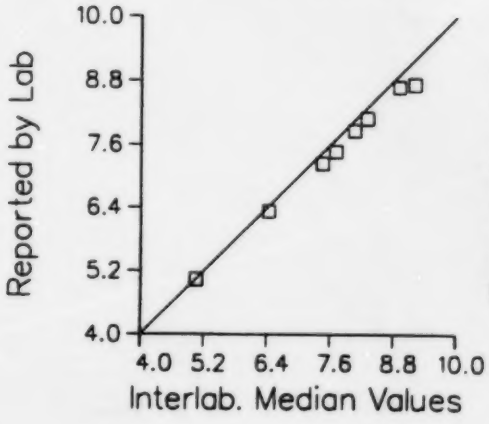
SS ,mg/L



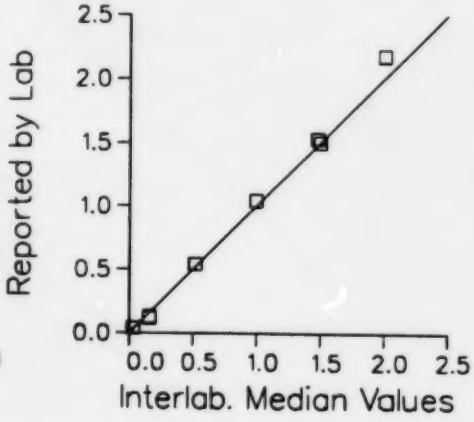
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

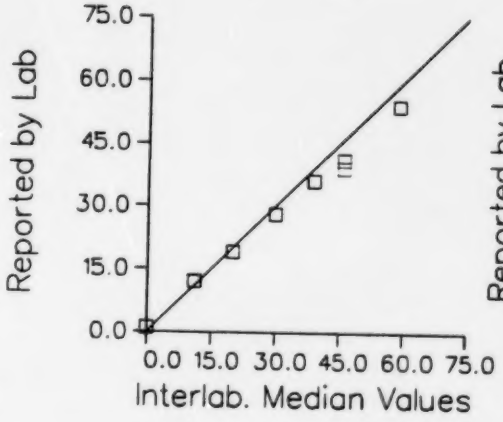


Lab Code: W0431

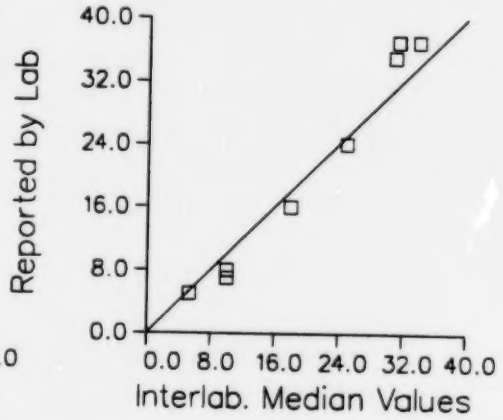
Laboratory: W0433

Comparison of Results Reported versus the Interlaboratory Median values

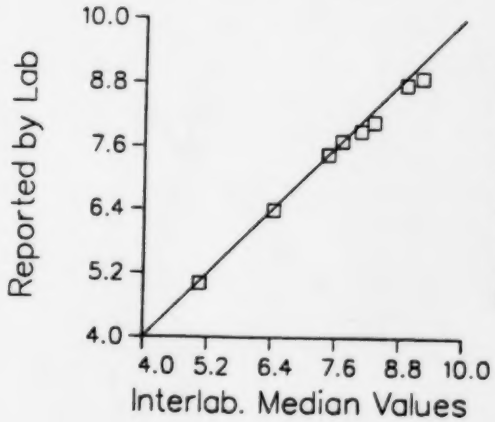
SS ,mg/L



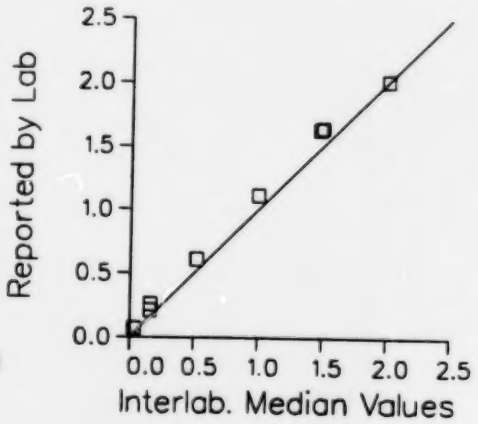
BOD ,mg/L



pH ,pH UNITS



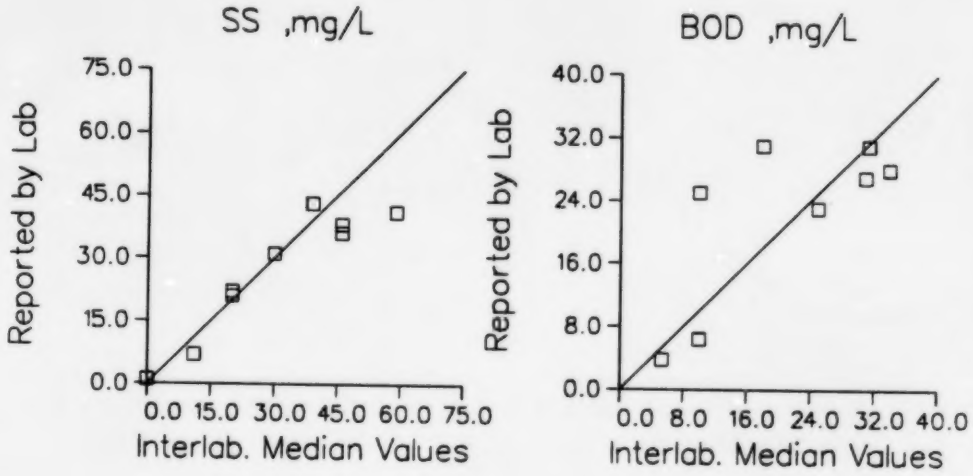
Total P ,mg/L

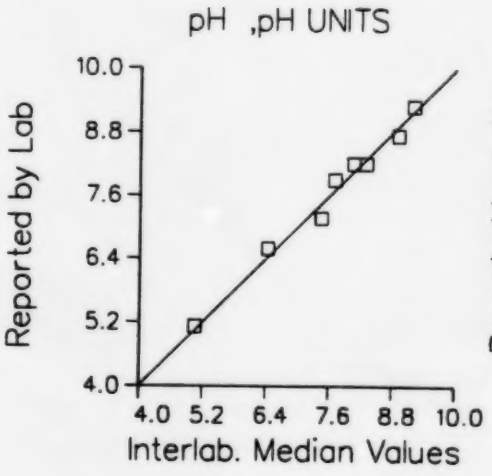


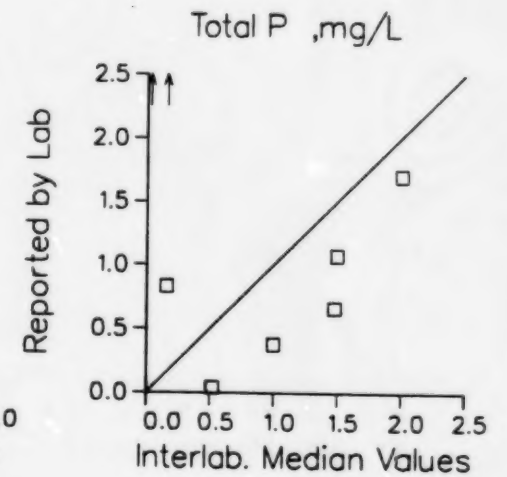
Lab Code: W0433

Laboratory: W0439

Comparison of Results Reported versus the Interlaboratory Median values





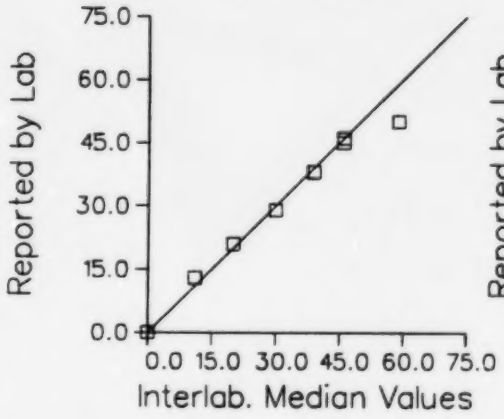


Lab Code: W0439

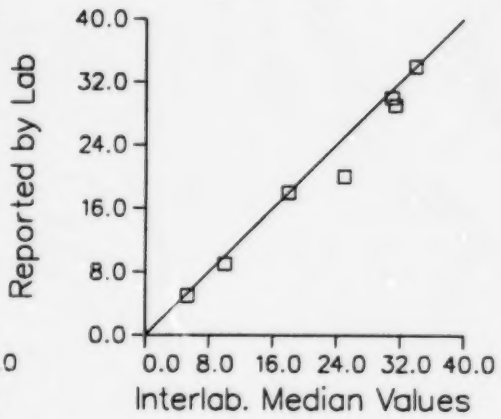
Laboratory: W0441

Comparison of Results Reported versus the Interlaboratory Median values

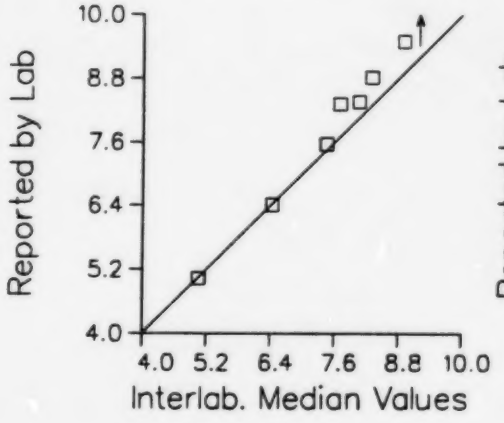
SS ,mg/L



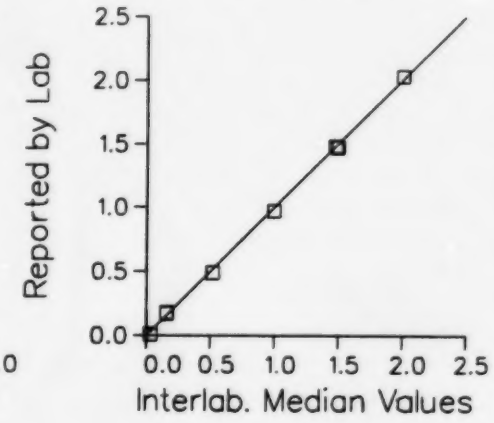
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

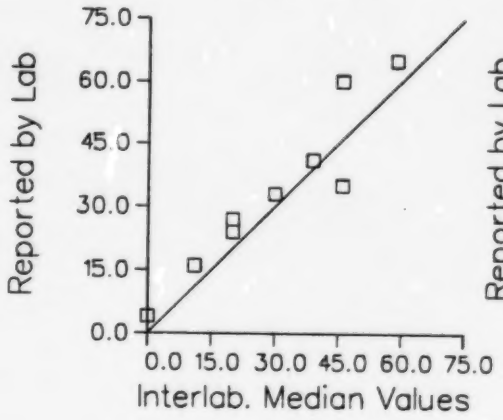


Lab Code: W0441

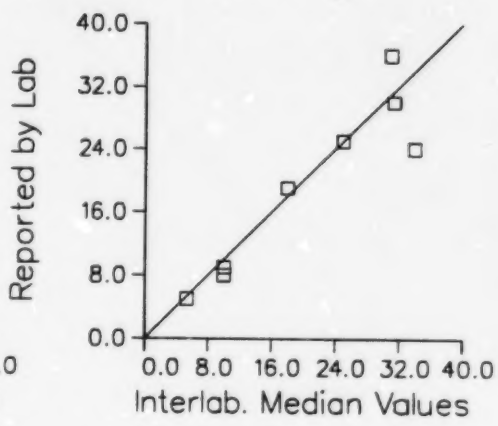
Laboratory: W0447

Comparison of Results Reported versus the Interlaboratory Median values

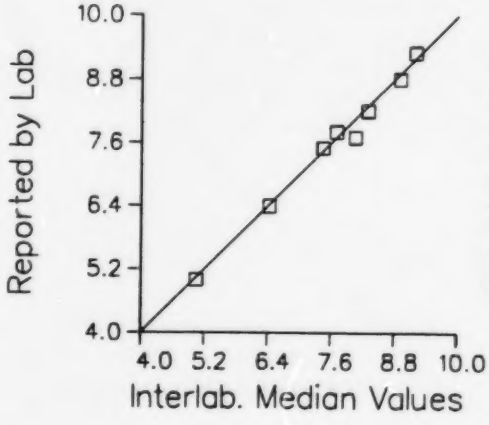
SS ,mg/L



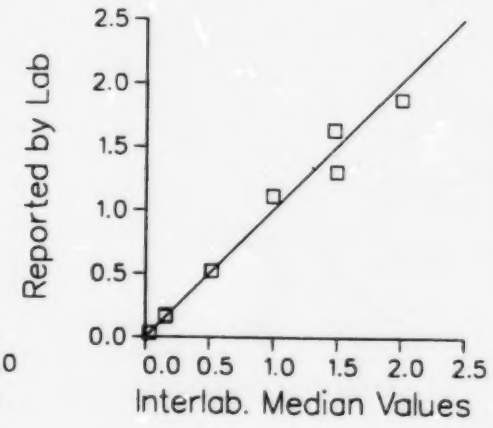
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

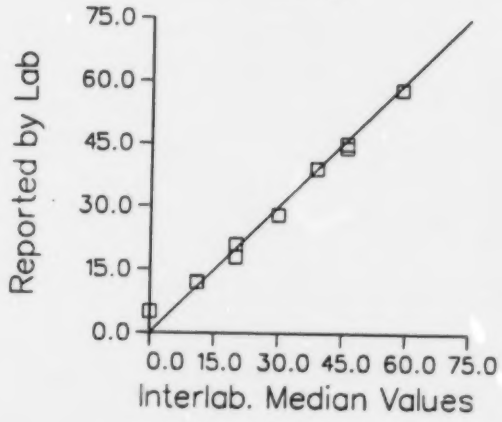


Lab Code: W0447

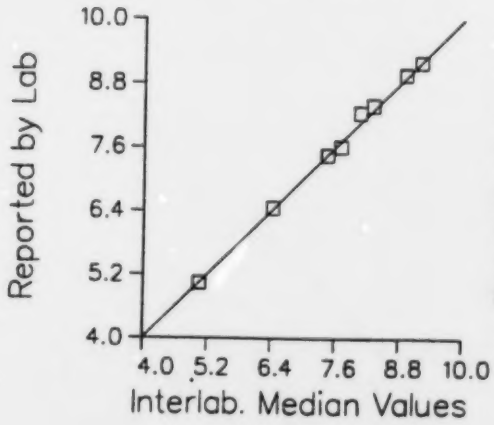
Laboratory: W0448

Comparison of Results Reported versus the Interlaboratory Median values

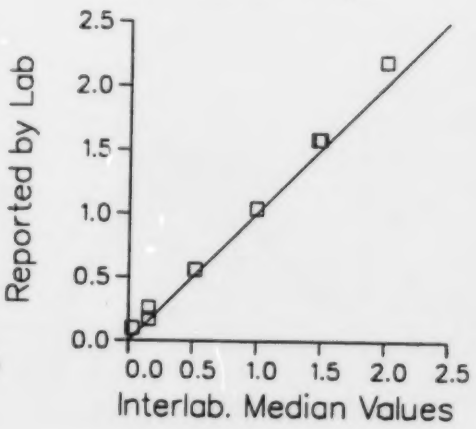
SS ,mg/L



pH ,pH UNITS



Total P ,mg/L

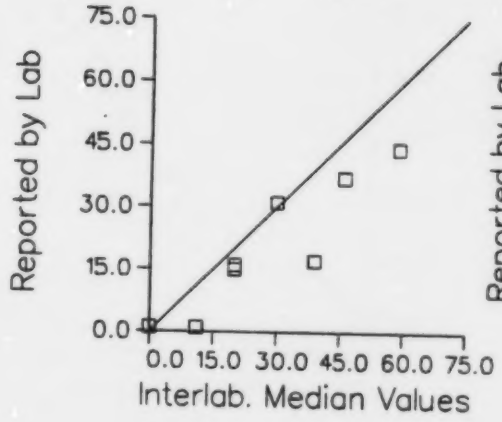


Lab Code: W0448

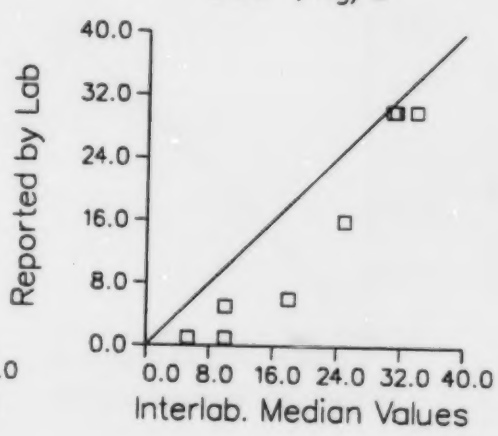
Laboratory: W0456

Comparison of Results Reported versus the Interlaboratory Median values

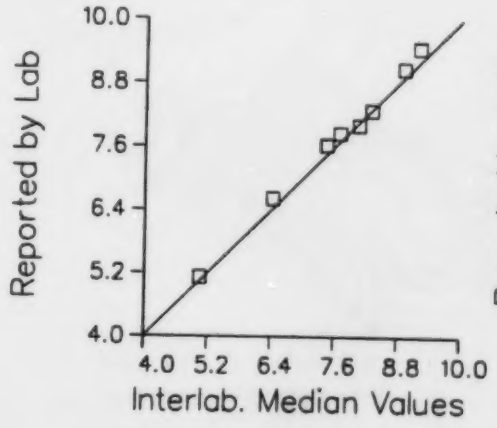
SS ,mg/L



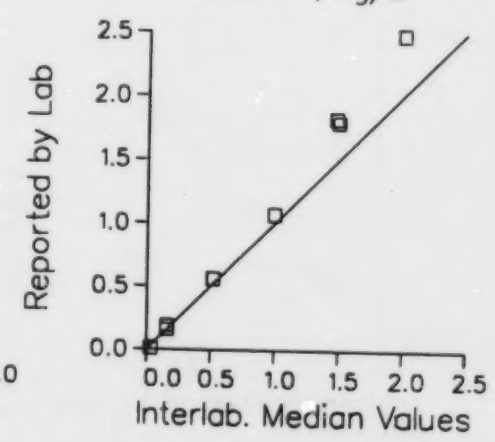
BOD ,mg/L



pH ,pH UNITS



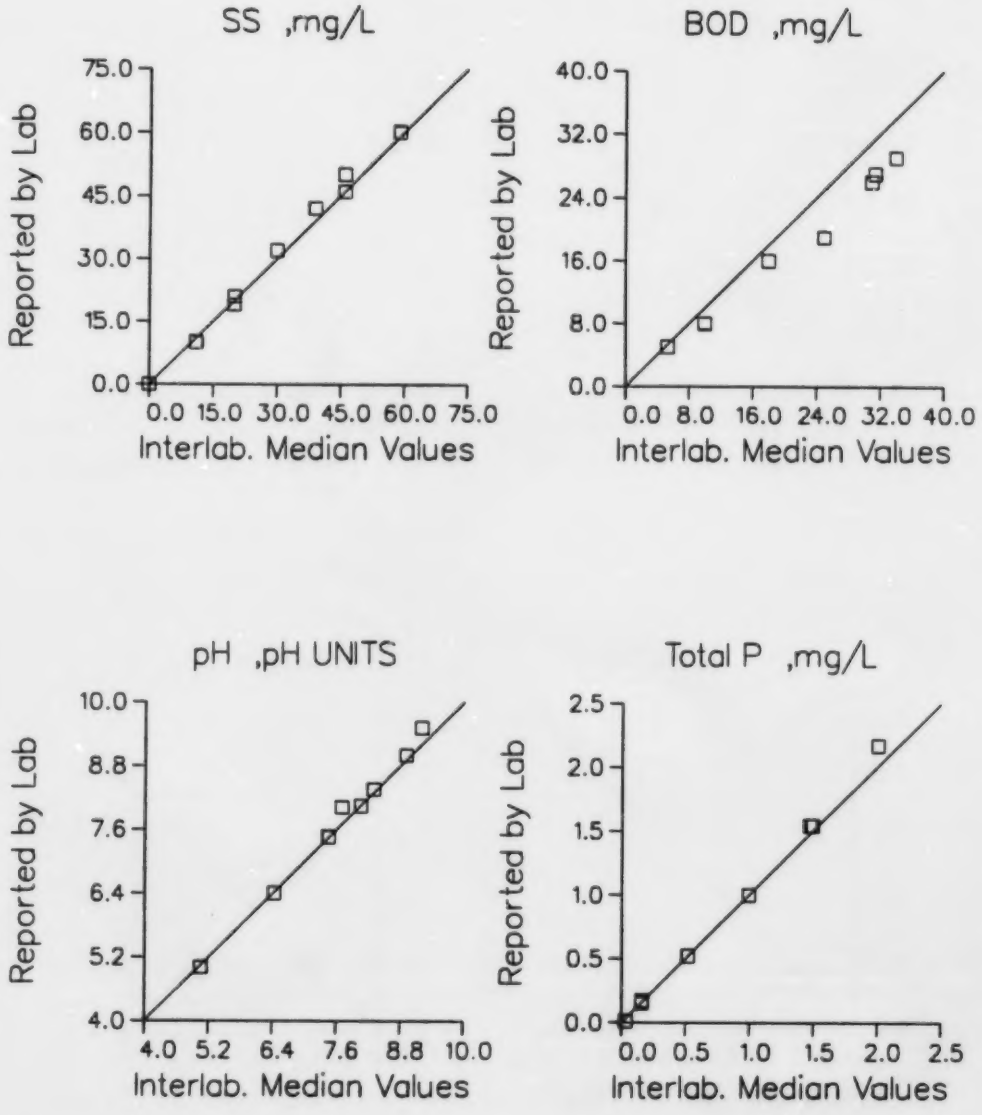
Total P ,mg/L



Lab Code: W0456

Laboratory: W0460

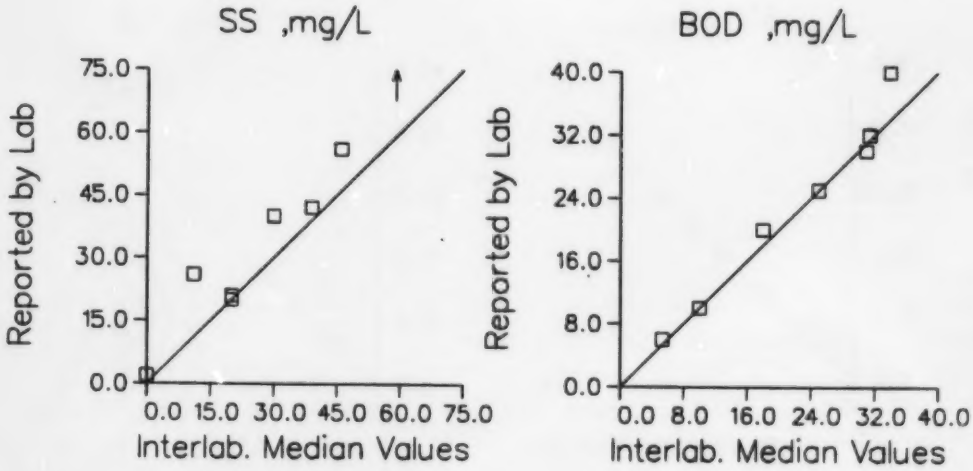
Comparison of Results Reported versus the Interlaboratory Median values

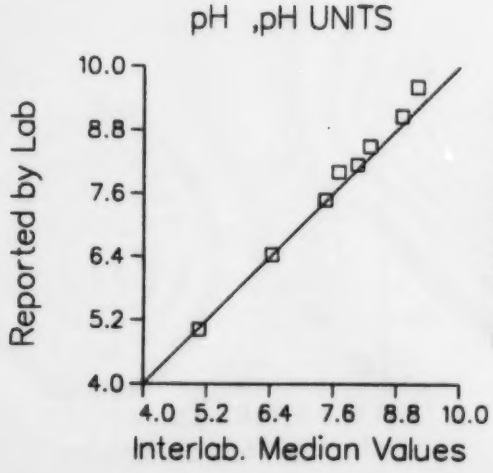


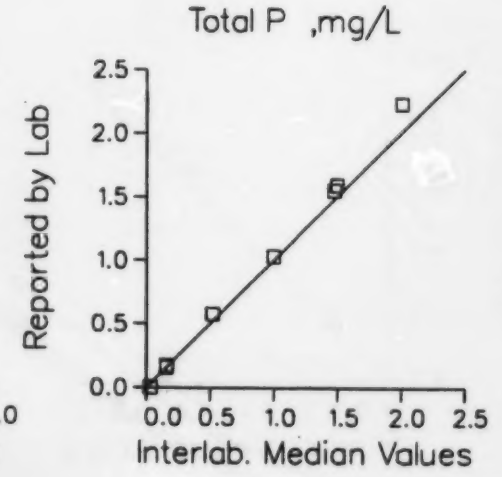
Lab Code: W0460

Laboratory: W0462

Comparison of Results Reported versus the Interlaboratory Median values





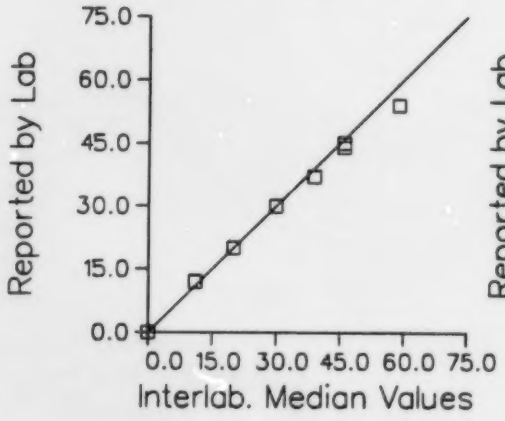


Lab Code: W0462

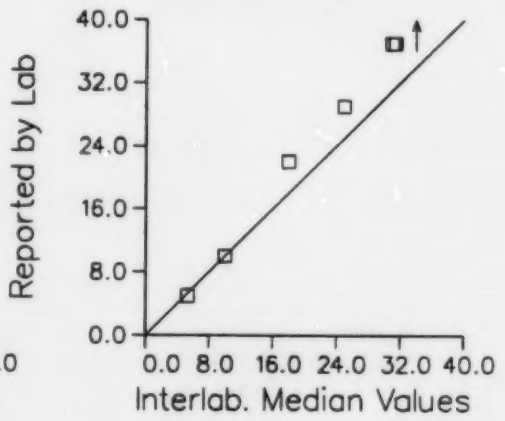
Laboratory: W0463

Comparison of Results Reported versus the Interlaboratory Median values

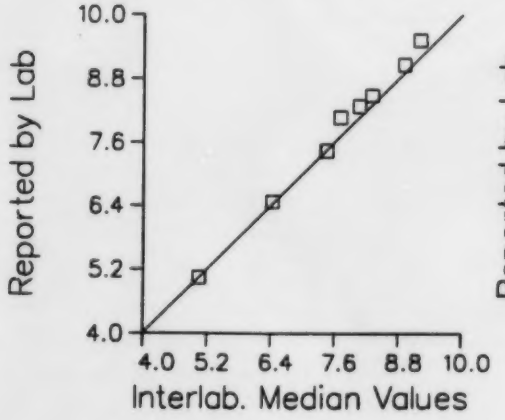
SS ,mg/L



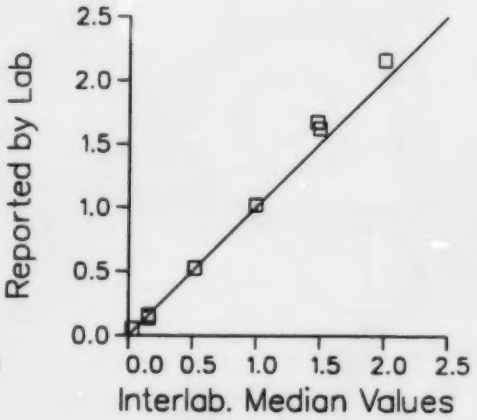
BOD ,mg/L



pH ,pH UNITS



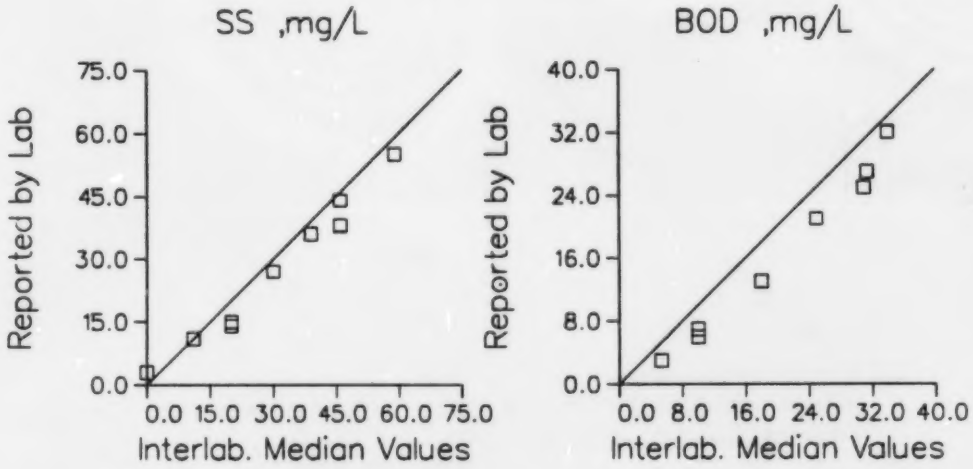
Total P ,mg/L

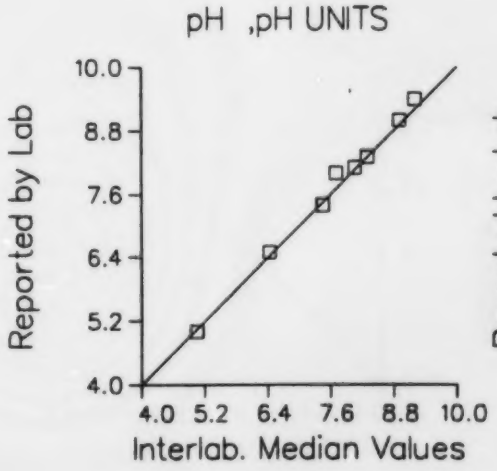


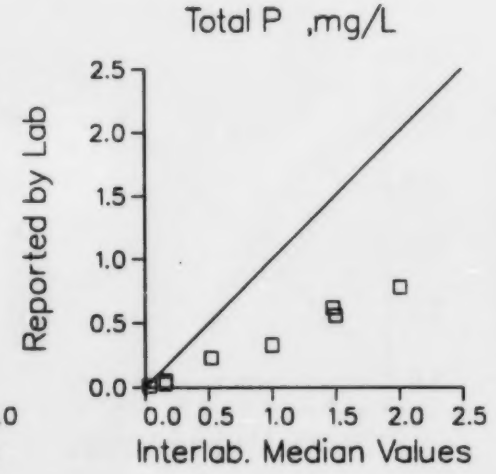
Lab Code: W0463

Laboratory: W0464

Comparison of Results Reported versus the Interlaboratory Median values



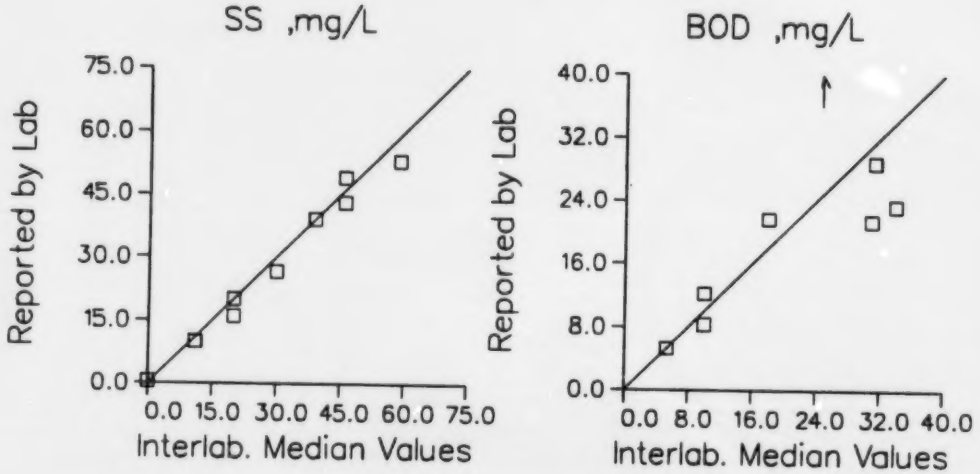


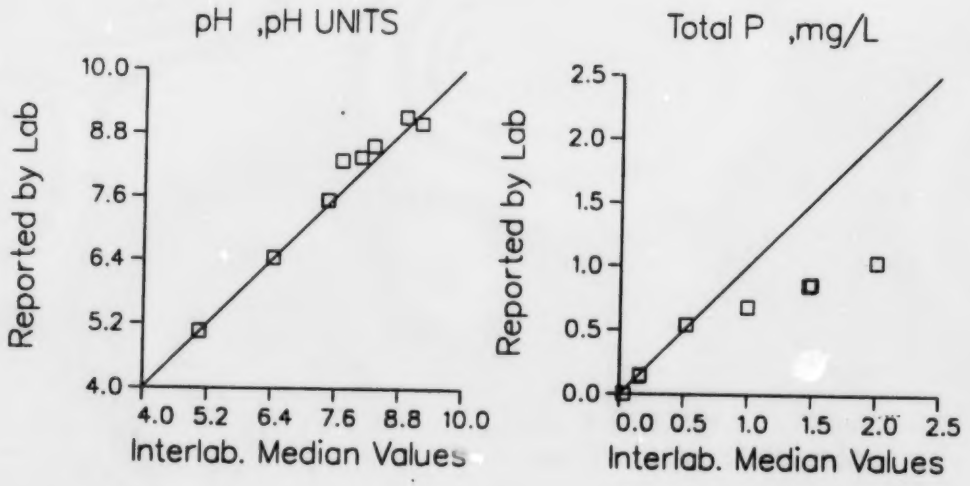


Lab Code: W0464

Laboratory: W0468

Comparison of Results Reported versus the Interlaboratory Median values

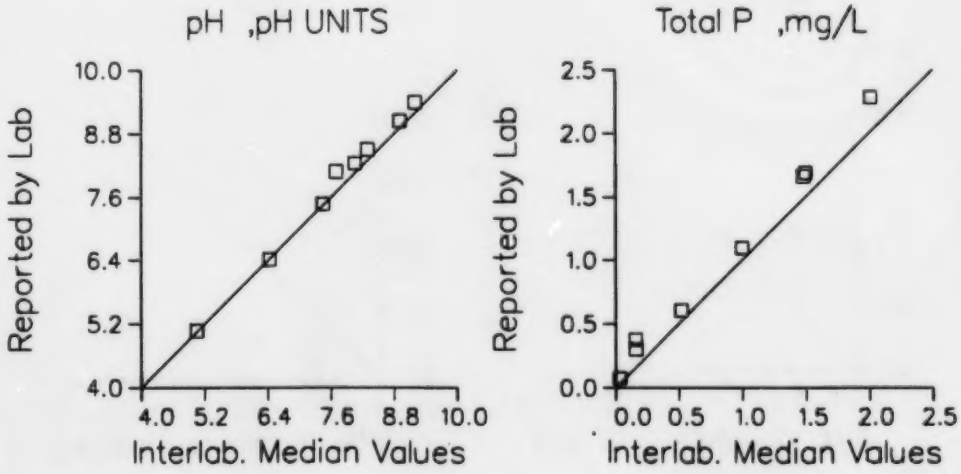




Lab Code: W0468

Laboratory: W0469

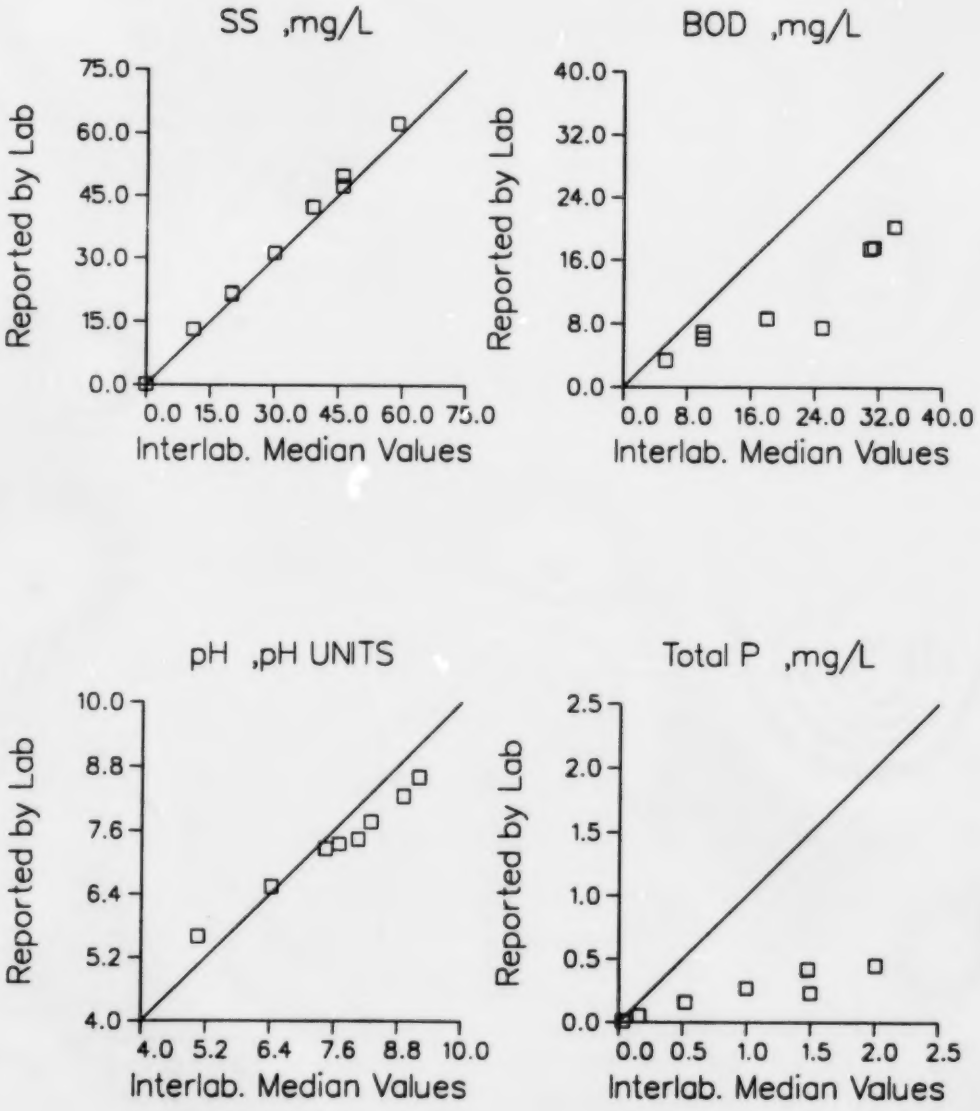
Comparison of Results Reported versus the Interlaboratory Median values



Lab Code: W0469

Laboratory: W0471

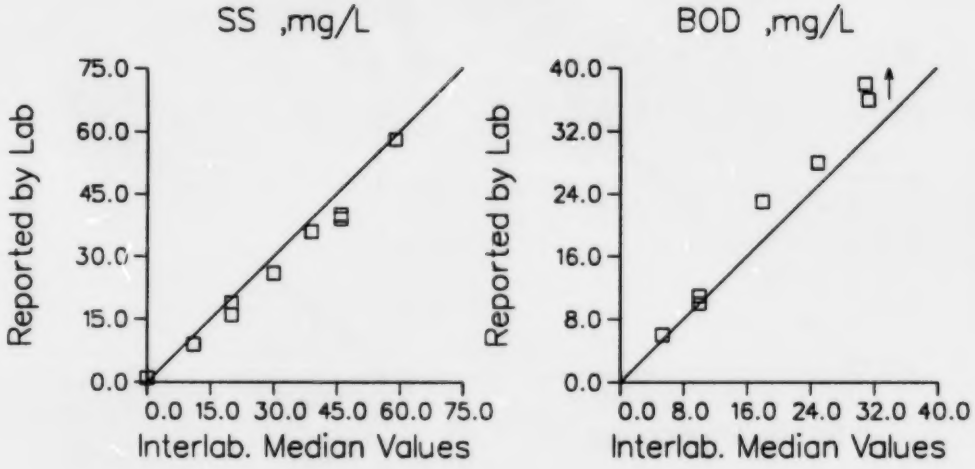
Comparison of Results Reported versus the Interlaboratory Median values

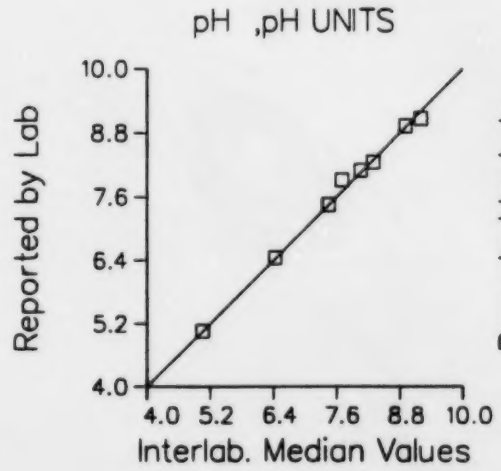


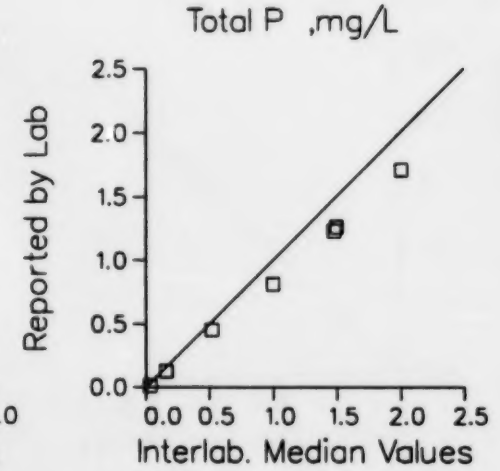
Lab Code: W0471

Laboratory: W0476

Comparison of Results Reported versus the Interlaboratory Median values



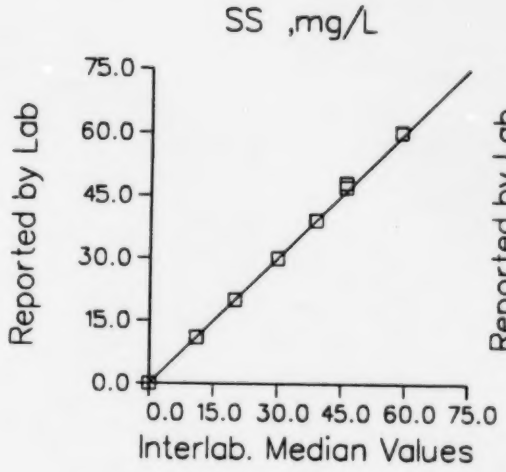


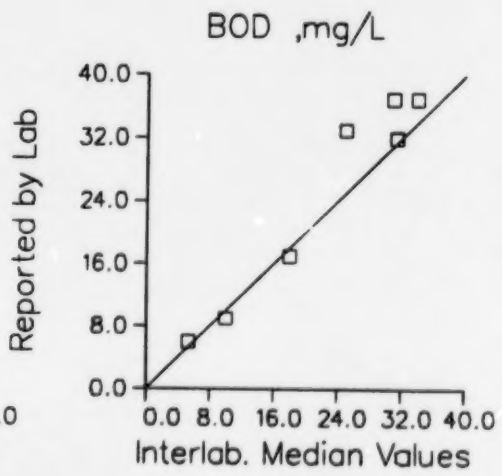


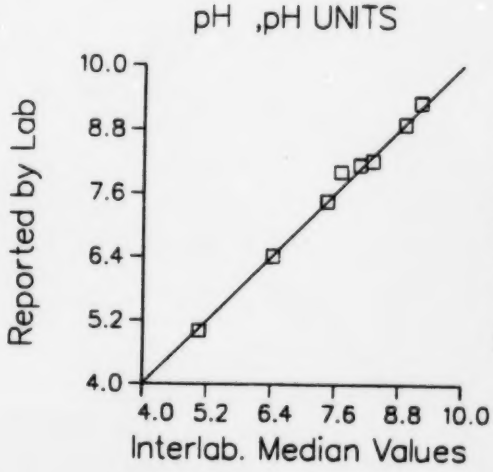
Lab Code: W0476

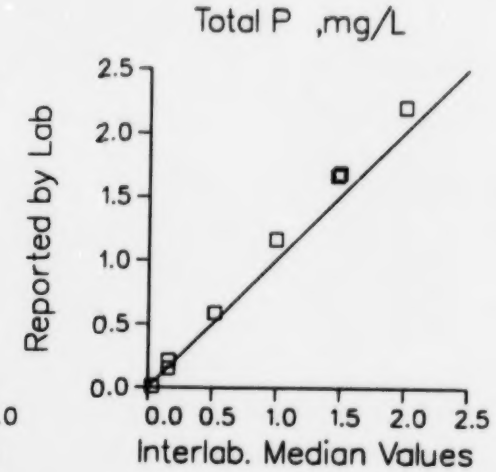
Laboratory: W0477

Comparison of Results Reported versus the Interlaboratory Median values





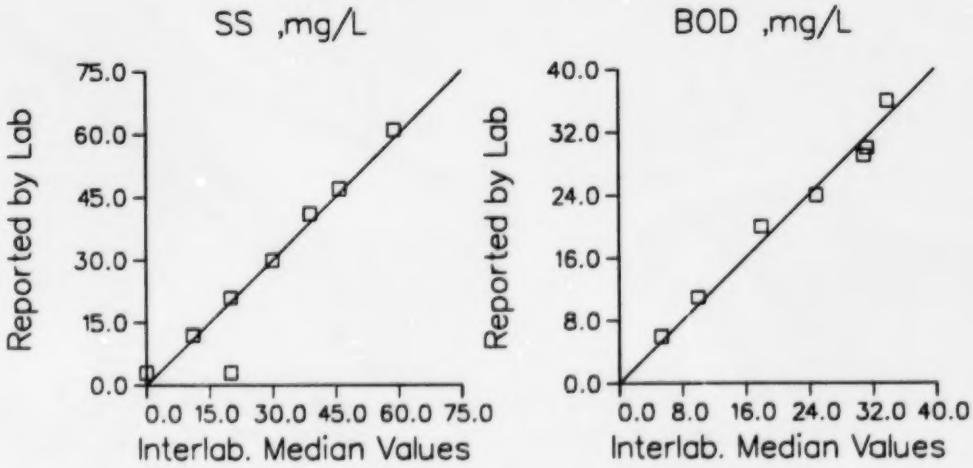


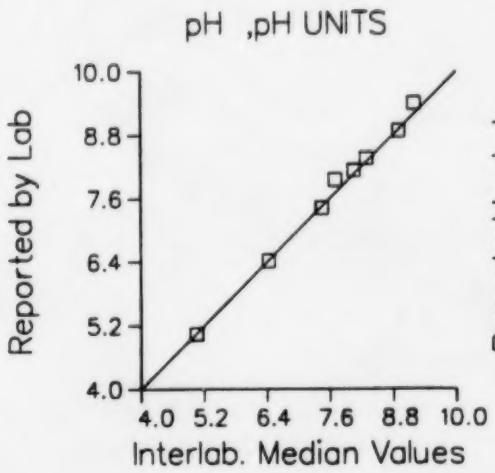


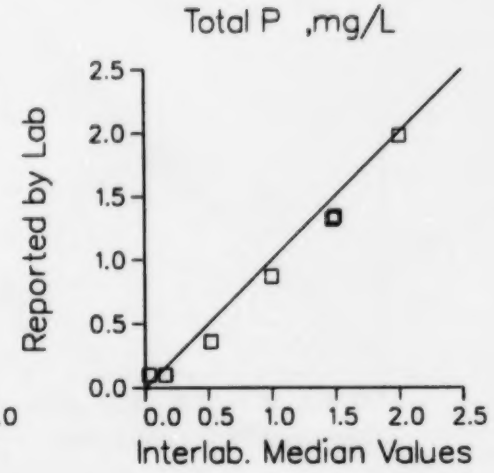
Lab Code: W0477

Laboratory: W0480

Comparison of Results Reported versus the Interlaboratory Median values





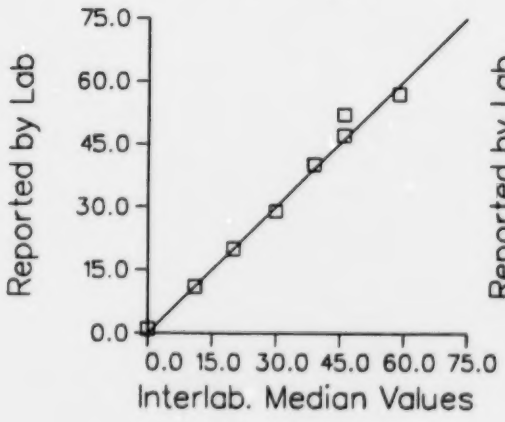


Lab Code: W0480

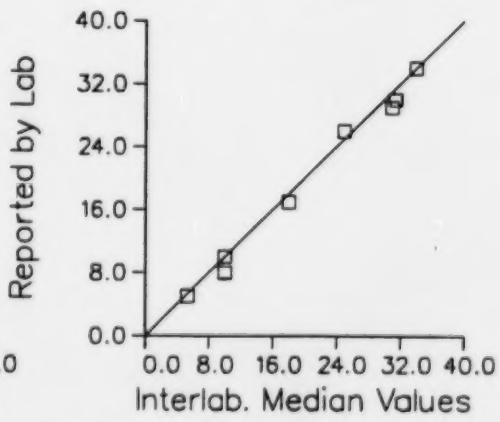
Laboratory: W0482

Comparison of Results Reported versus the Interlaboratory Median values

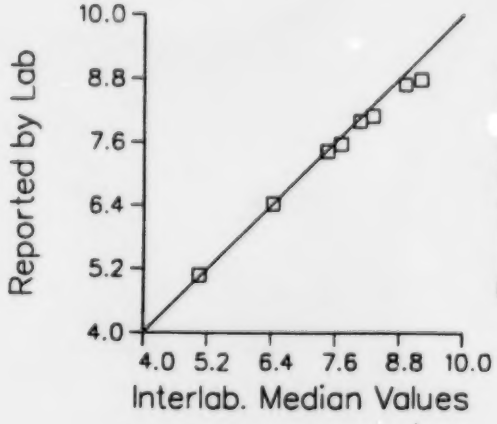
SS ,mg/L



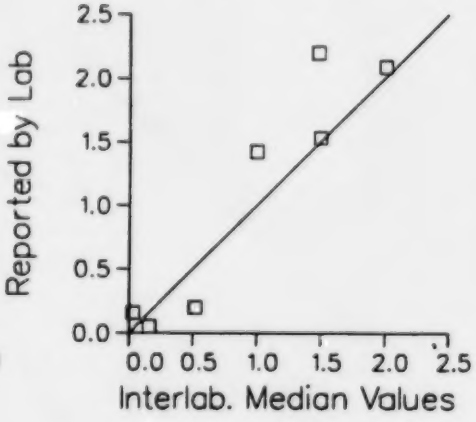
BOD ,mg/L



pH ,pH UNITS



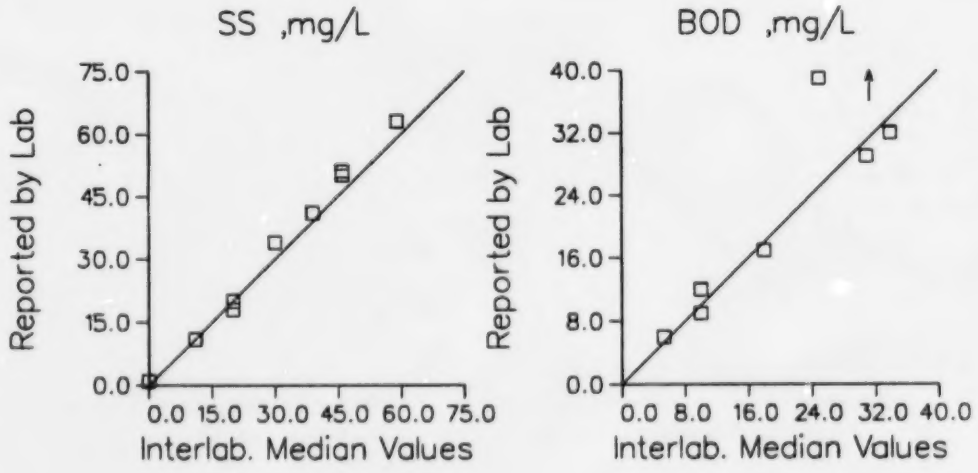
Total P ,mg/L



Lab Code: W0482

Laboratory: W0485

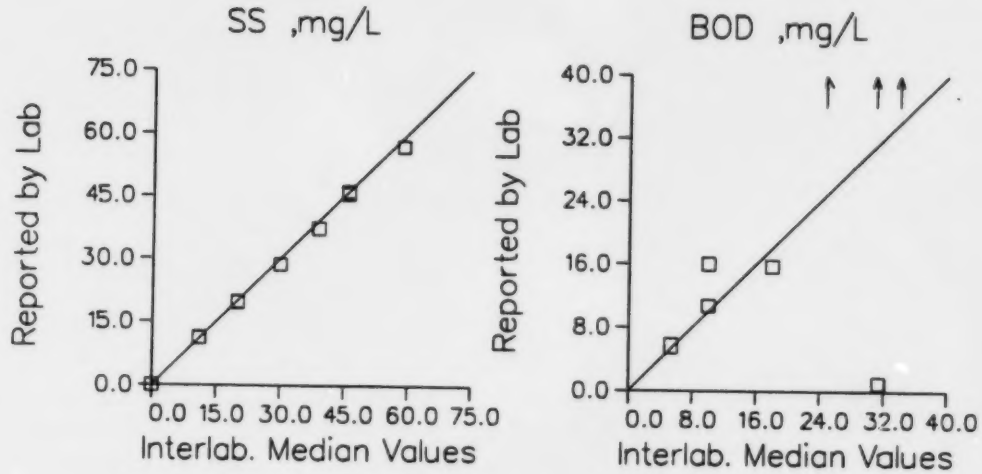
Comparison of Results Reported versus the Interlaboratory Median values

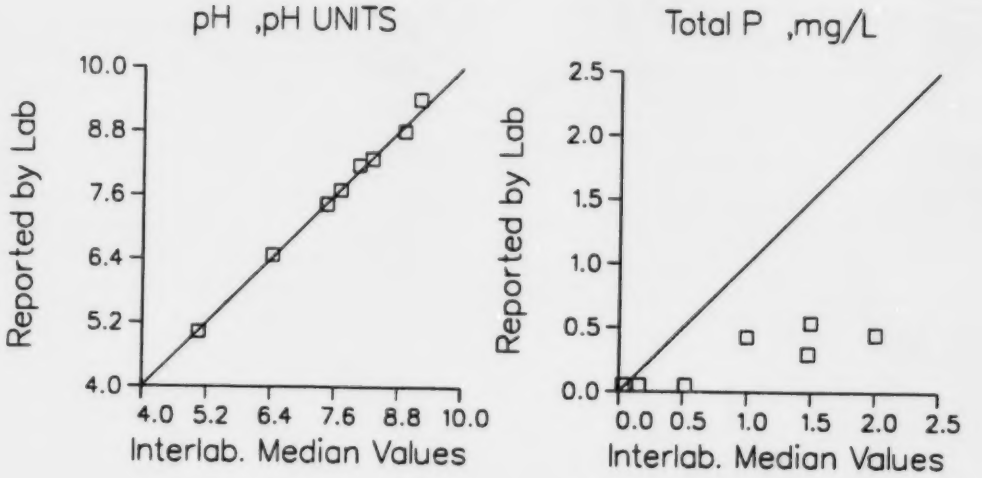


Lab Code: W0485

Laboratory: W0489

Comparison of Results Reported versus the Interlaboratory Median values



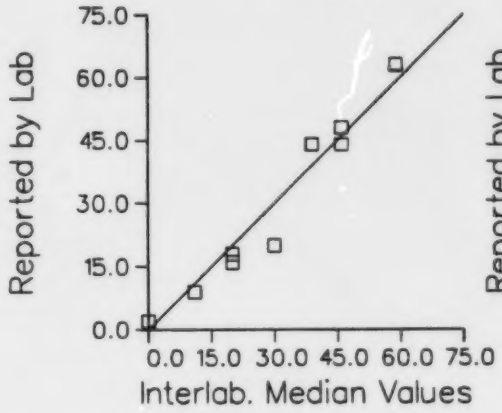


Lab Code: W0489

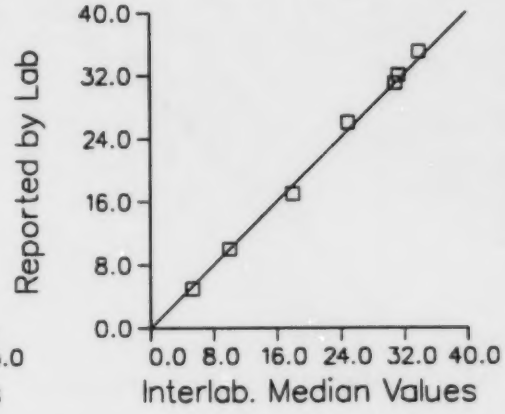
Laboratory: W0493

Comparison of Results Reported versus the Interlaboratory Median values

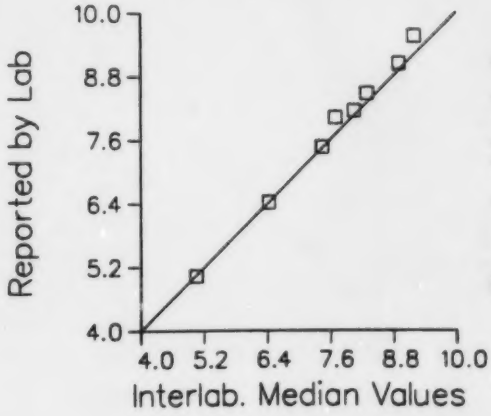
SS ,mg/L



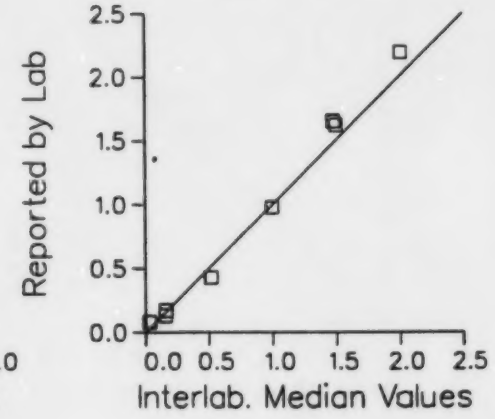
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

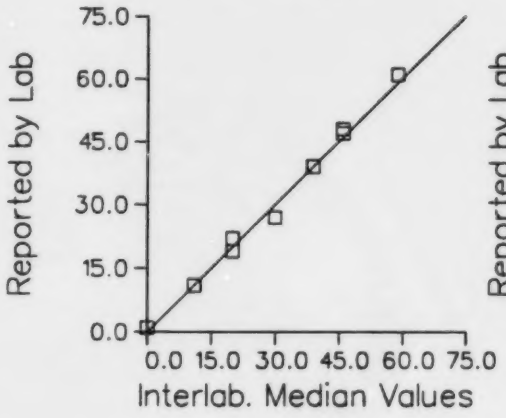


Lab Code: W0493

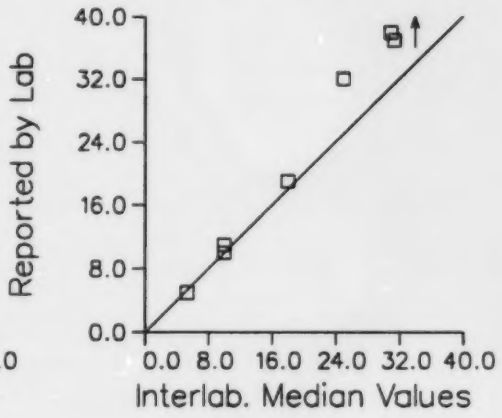
Laboratory: W0497

Comparison of Results Reported versus the Interlaboratory Median values

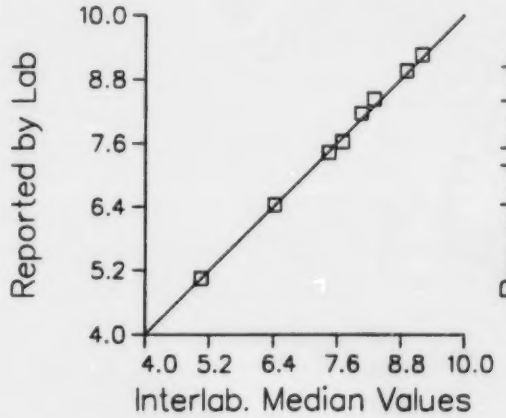
SS ,mg/L



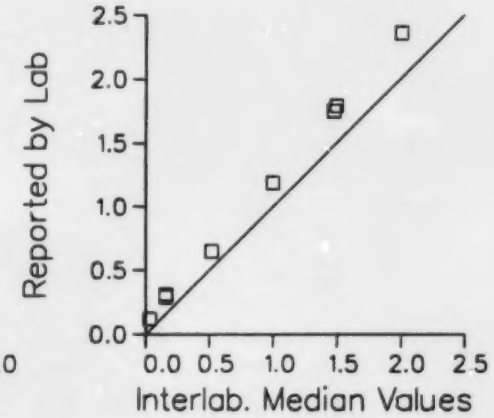
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

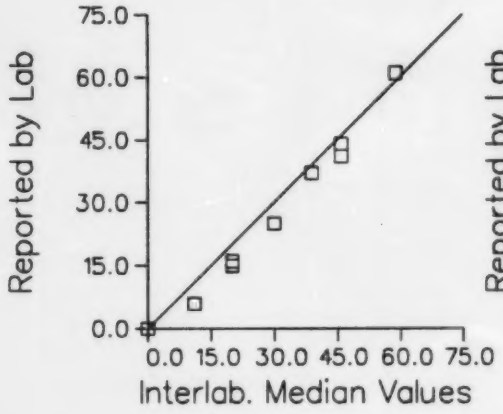


Lab Code: W0497

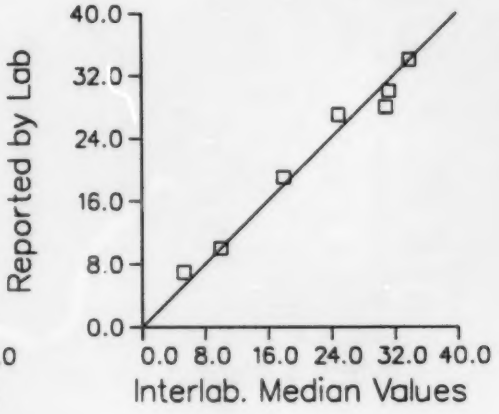
Laboratory: W0498

Comparison of Results Reported versus the Interlaboratory Median values

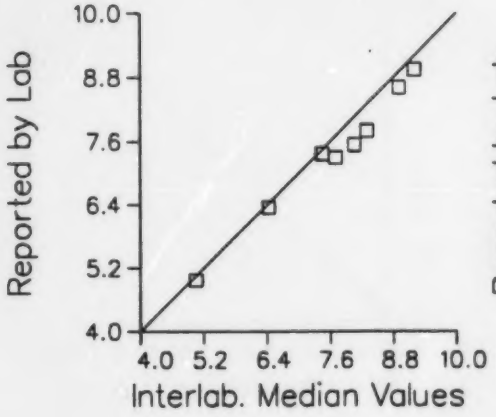
SS ,mg/L



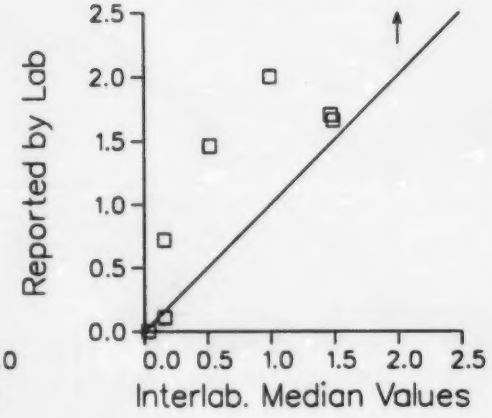
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

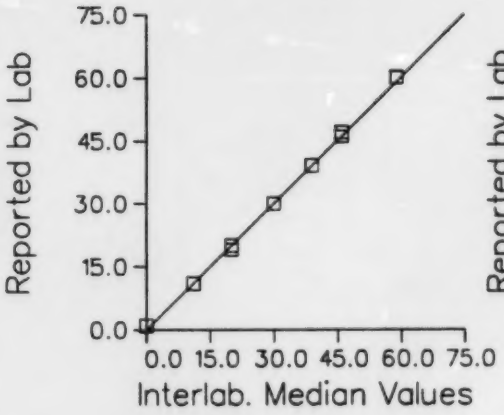


Lab Code: W0498

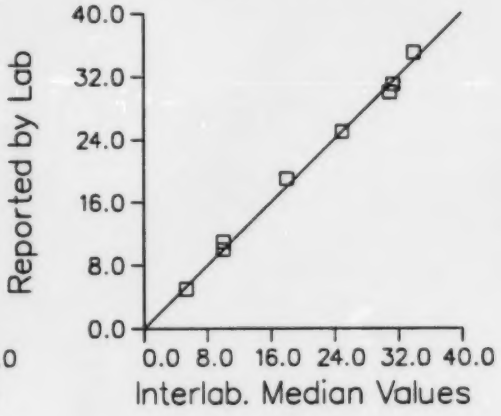
Laboratory: W0506

Comparison of Results Reported versus the Interlaboratory Median values

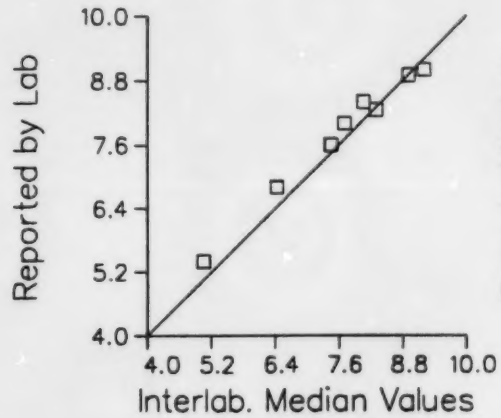
SS ,mg/L



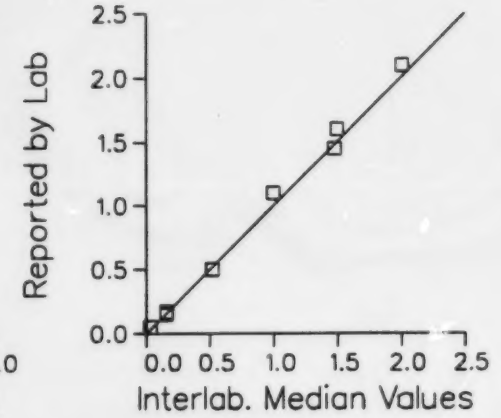
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

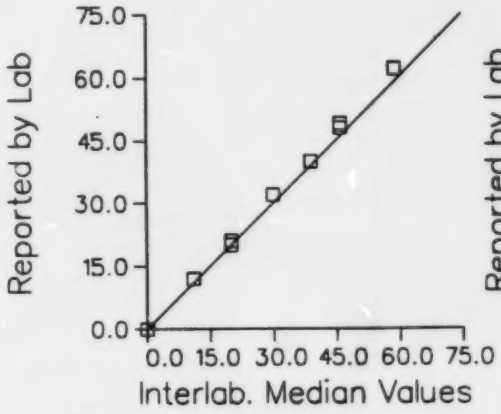


Lab Code: W0506

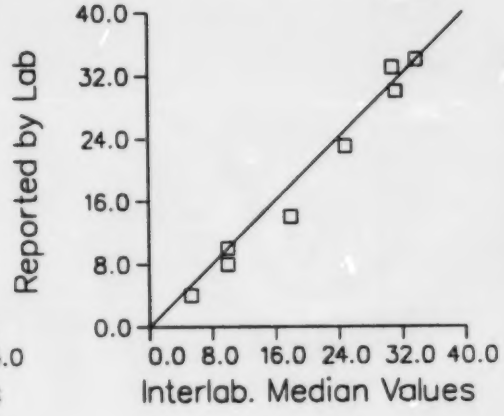
Laboratory: W0511

Comparison of Results Reported versus the Interlaboratory Median values

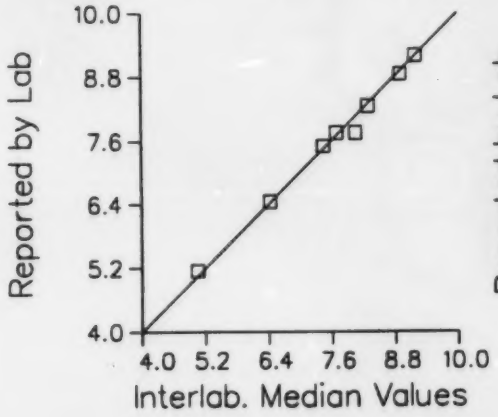
SS ,mg/L



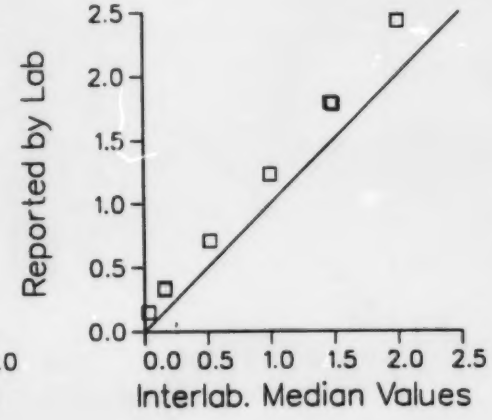
BOD ,mg/L



pH ,pH UNITS



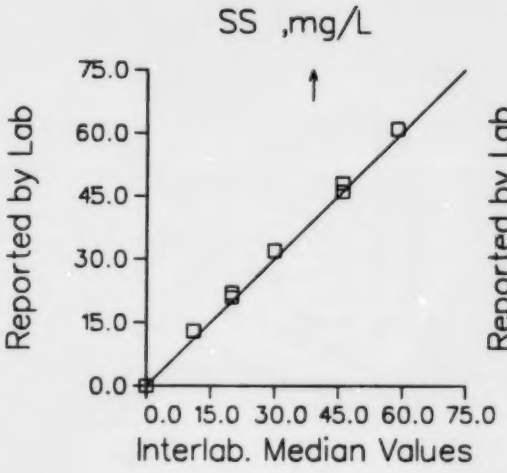
Total P ,mg/L

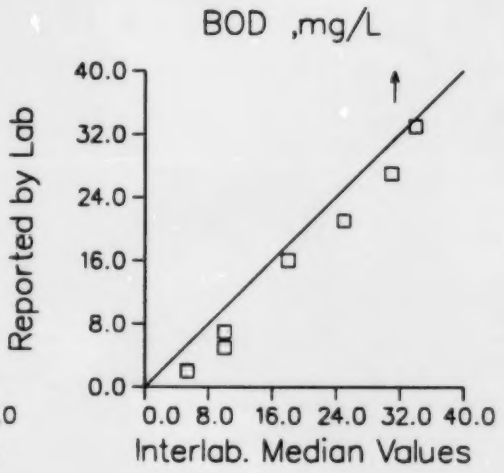


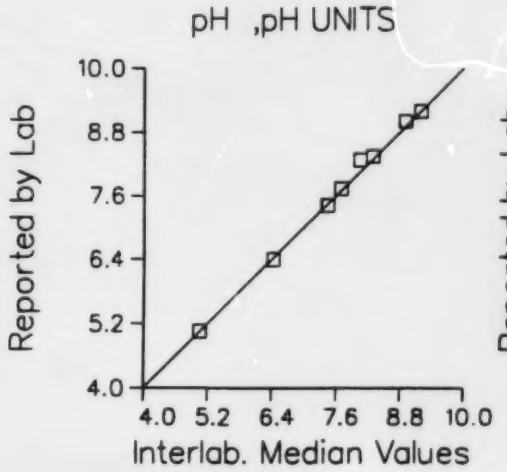
Lab Code: W0511

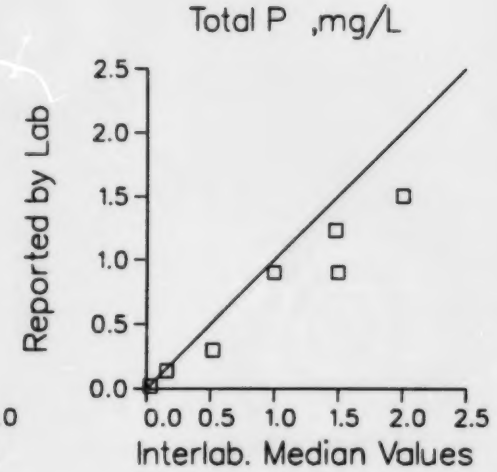
Laboratory: W0514

Comparison of Results Reported versus the Interlaboratory Median values





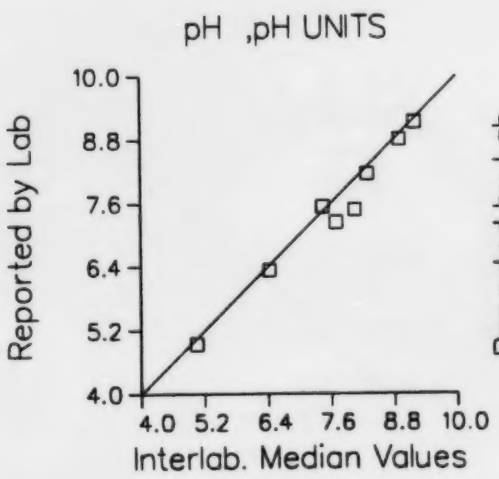


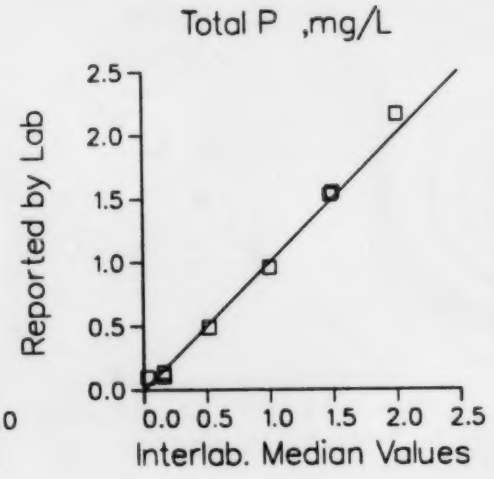


Lab Code: W0514

Laboratory: W0515

Comparison of Results Reported versus the Interlaboratory Median values



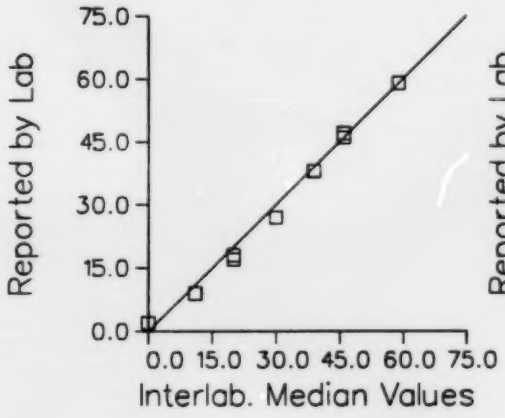


Lab Code: W0515

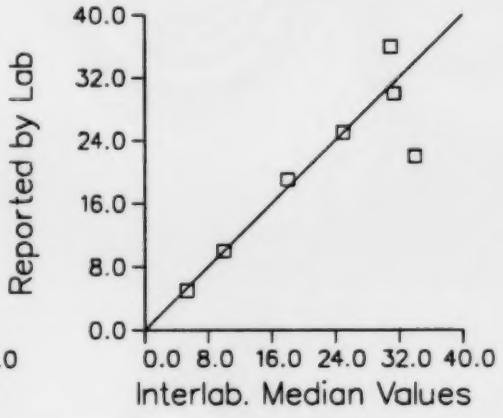
Laboratory: W0516

Comparison of Results Reported versus the Interlaboratory Median values

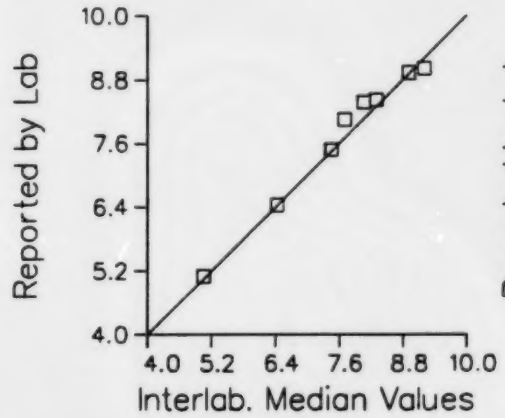
SS ,mg/L



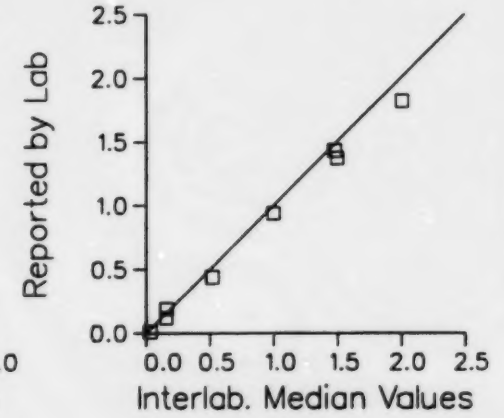
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

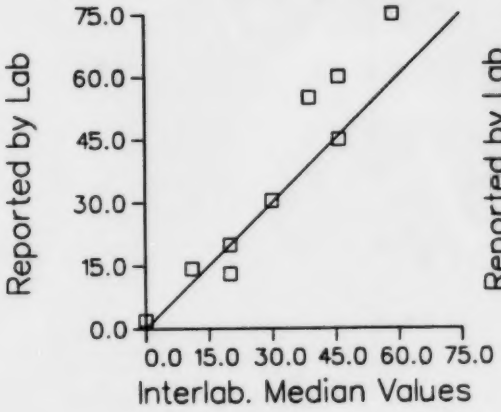


Lab Code: W0516

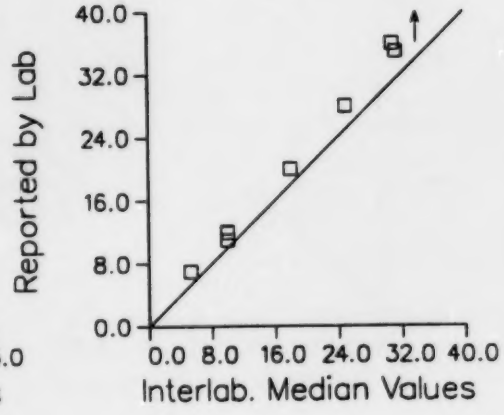
Laboratory: W0524

Comparison of Results Reported versus the Interlaboratory Median values

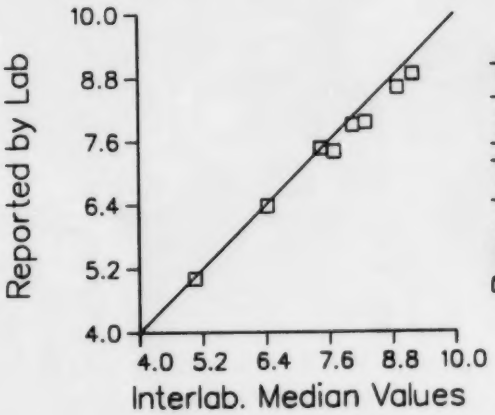
SS ,mg/L



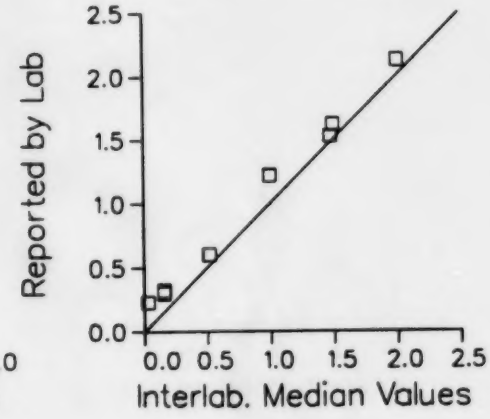
BOD ,mg/L



pH ,pH UNITS



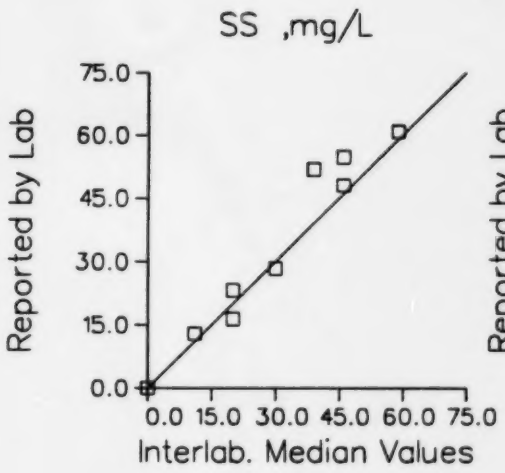
Total P ,mg/L

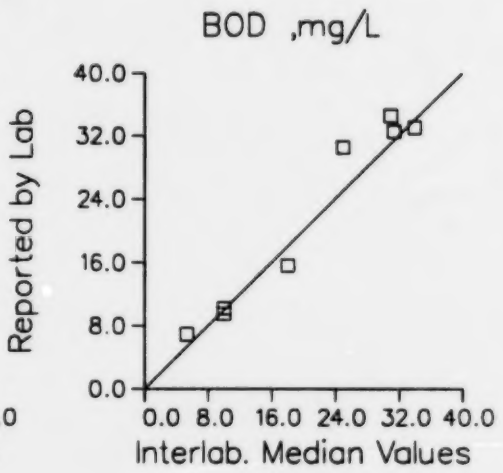


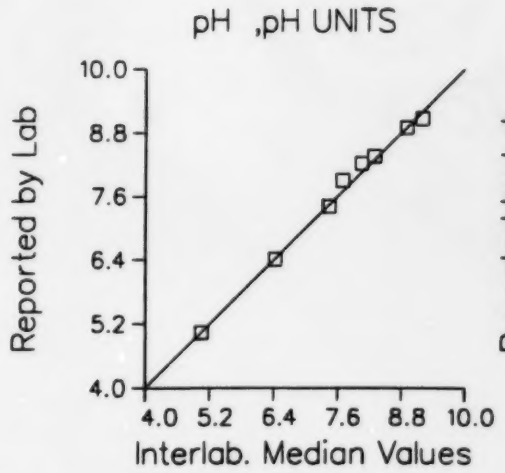
Lab Code: W0524

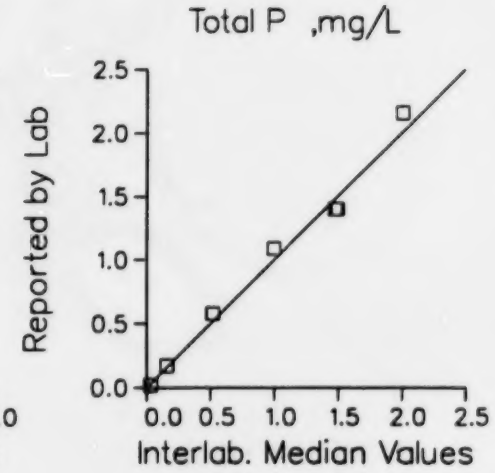
Laboratory: W0526

Comparison of Results Reported versus the Interlaboratory Median values







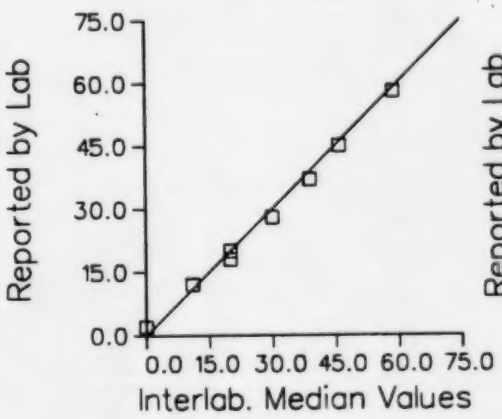


Lab Code: W0526

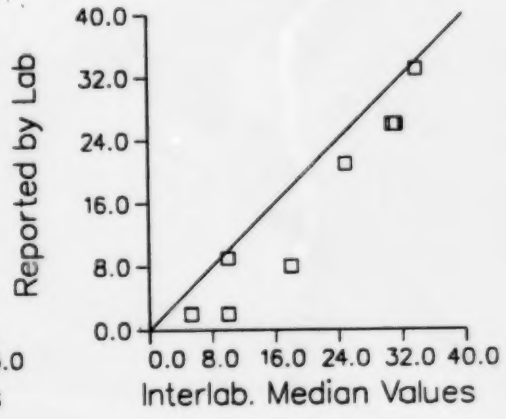
Laboratory: W0528

Comparison of Results Reported versus the Interlaboratory Median values

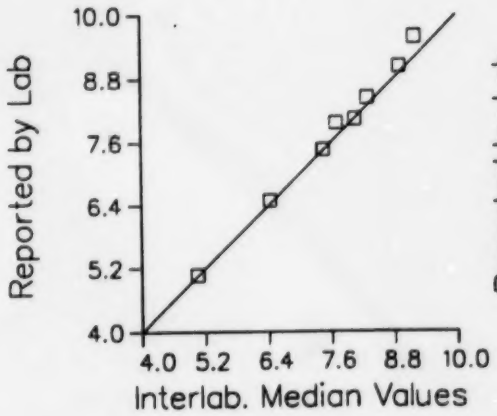
SS ,mg/L



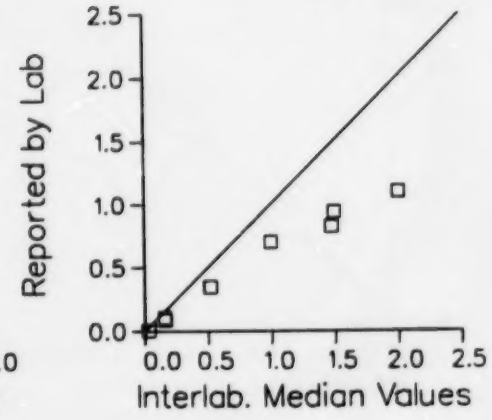
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

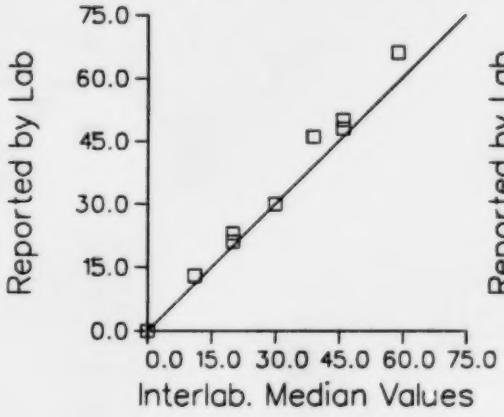


Lab Code: W0528

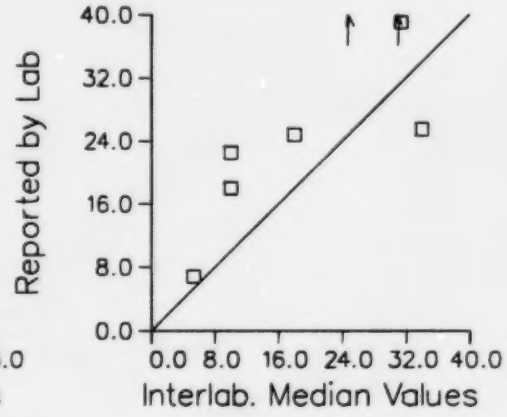
Laboratory: W0529

Comparison of Results Reported versus the Interlaboratory Median values

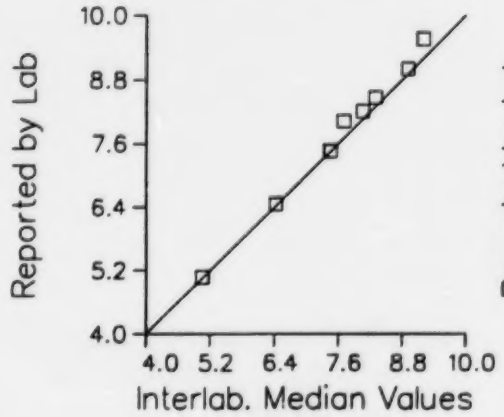
SS ,mg/L



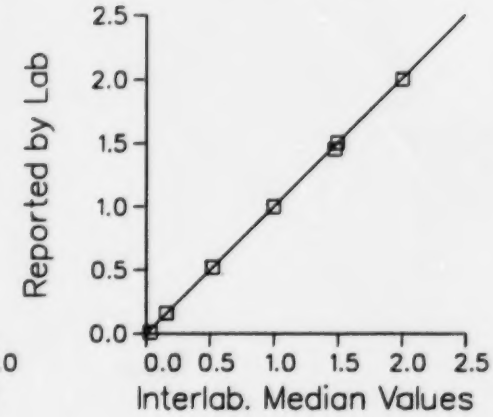
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

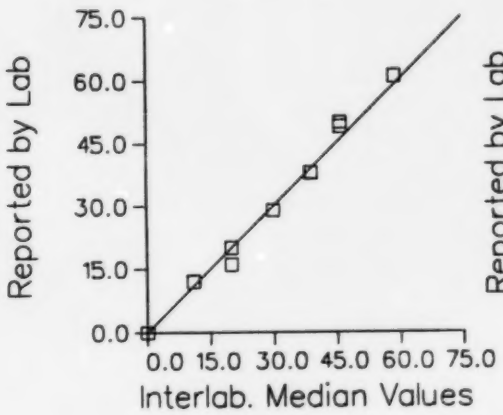


Lab Code: W0529

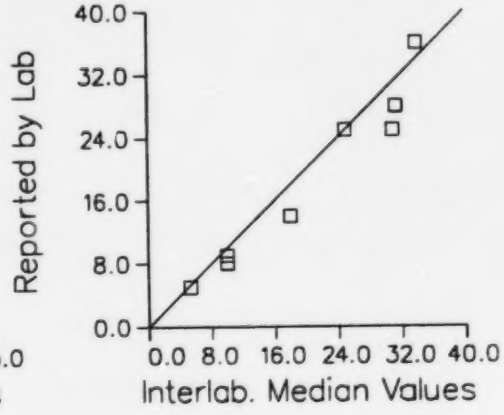
Laboratory: W0533

Comparison of Results Reported versus the Interlaboratory Median values

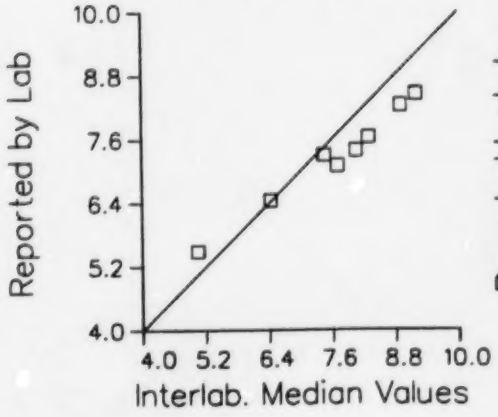
SS ,mg/L



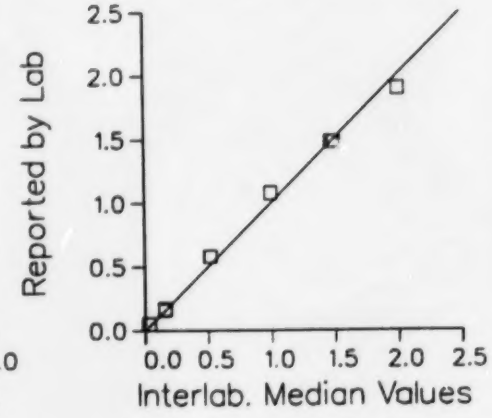
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

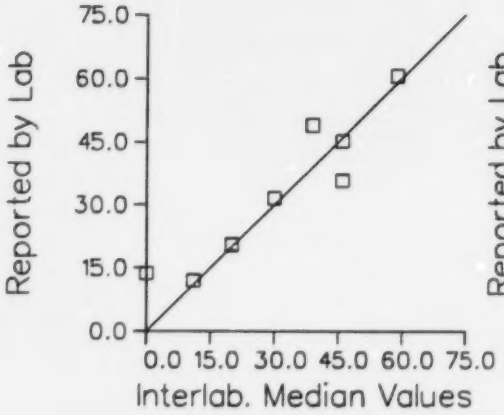


Lab Code: W0533

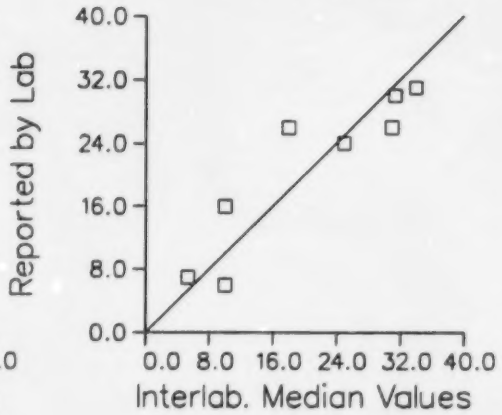
Laboratory: W0535

Comparison of Results Reported versus the Interlaboratory Median values

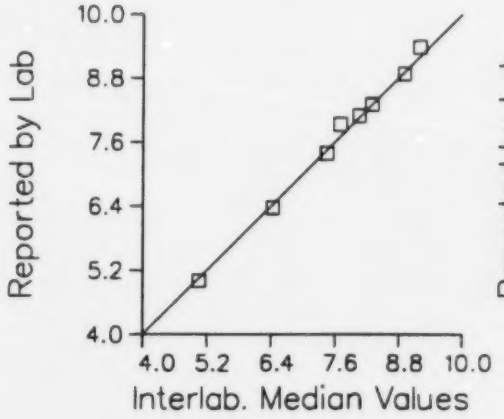
SS ,mg/L



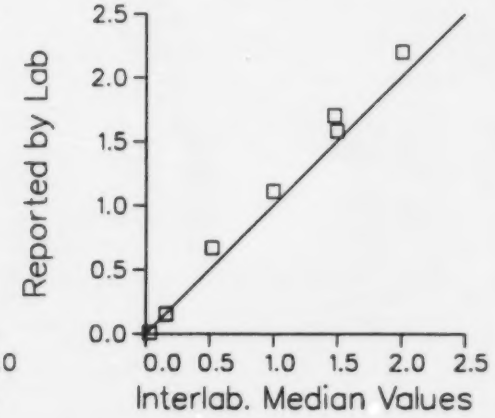
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

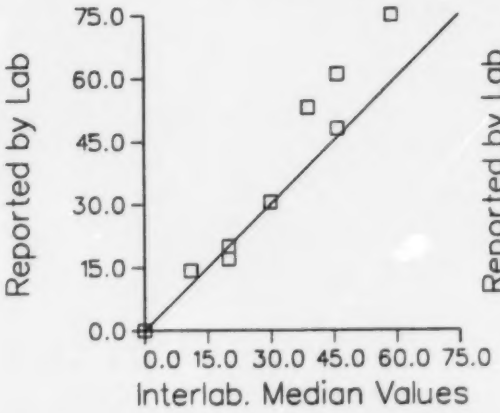


Lab Code: W0535

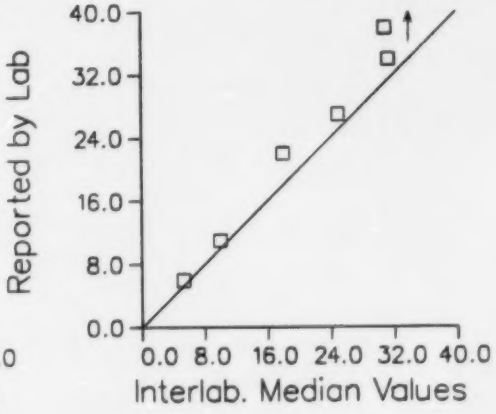
Laboratory: W0538

Comparison of Results Reported versus the Interlaboratory Median values

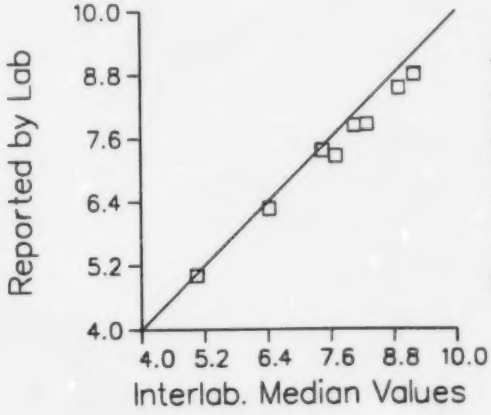
SS ,mg/L



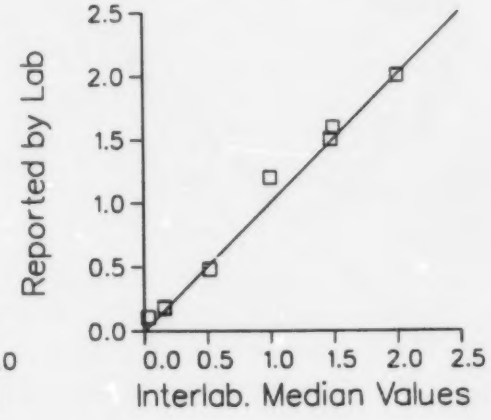
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

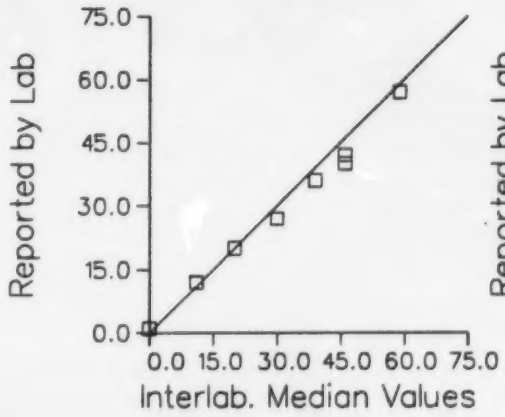


Lab Code: W0538

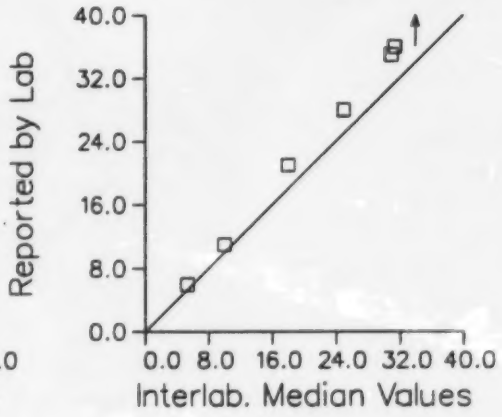
Laboratory: W0542

Comparison of Results Reported versus the Interlaboratory Median values

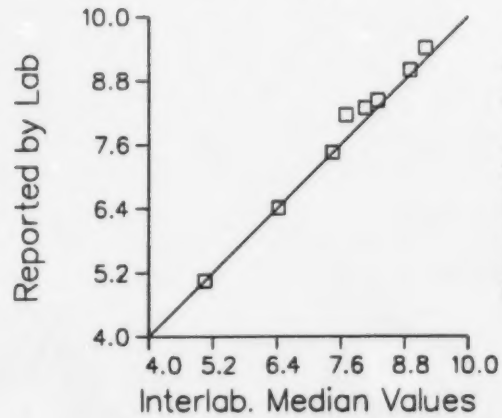
SS ,mg/L



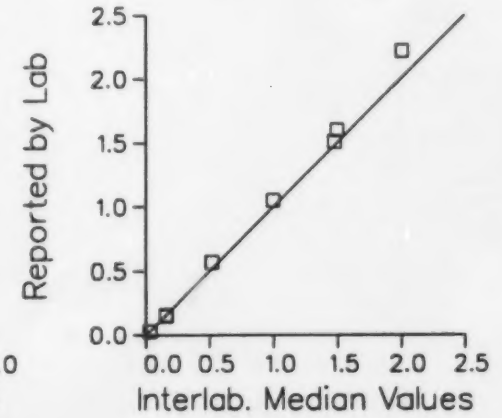
BOD ,mg/L



pH ,pH UNITS



Total P ,mg/L

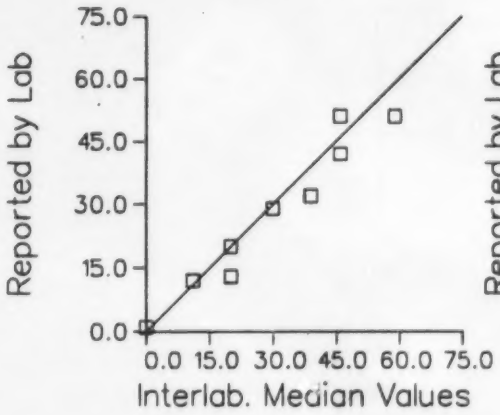


Lab Code: W0542

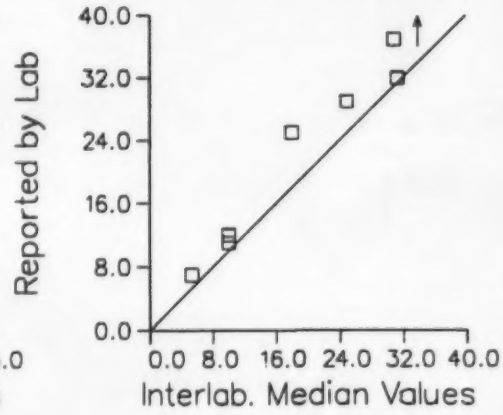
Laboratory: W0551

Comparison of Results Reported versus the Interlaboratory Median values

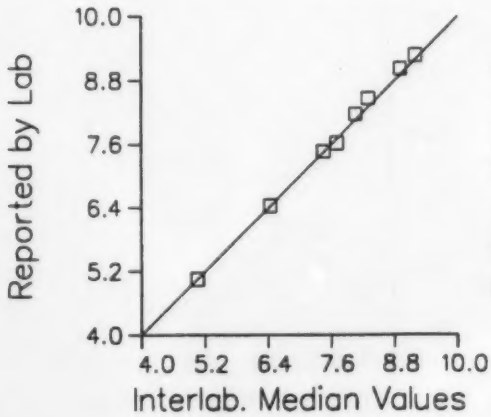
SS ,mg/L



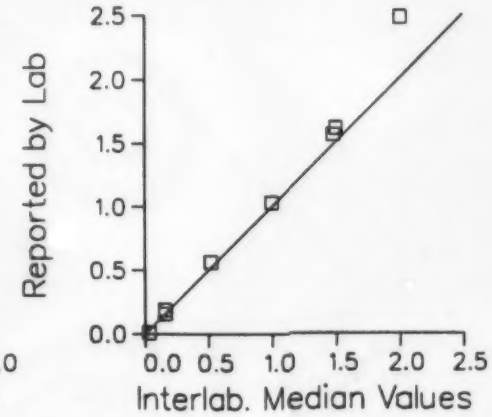
BOD ,mg/L



pH ,pH UNITS



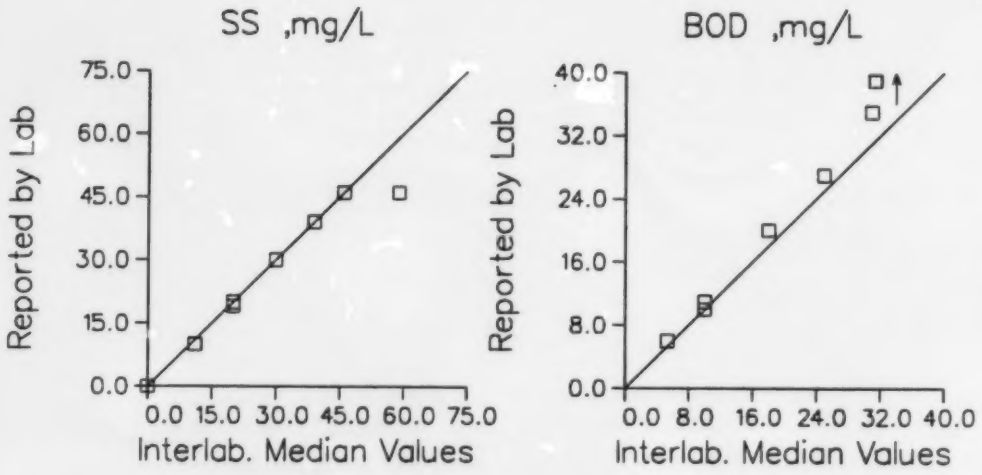
Total P ,mg/L

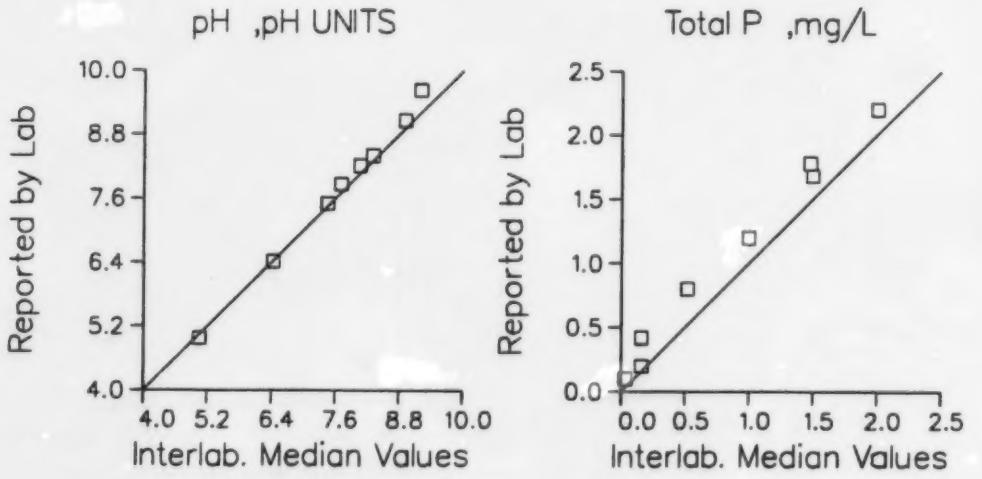


Lab Code: W0551

Laboratory: W0552

Comparison of Results Reported versus the Interlaboratory Median values

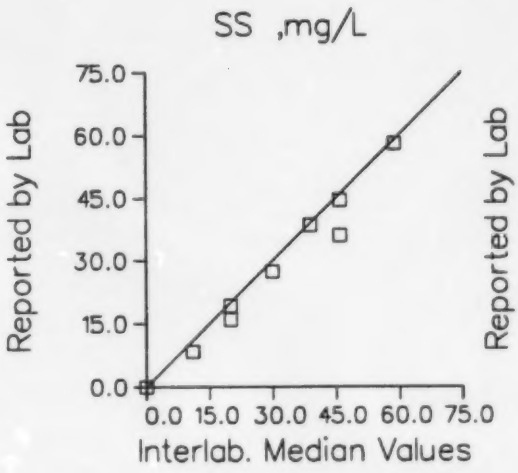


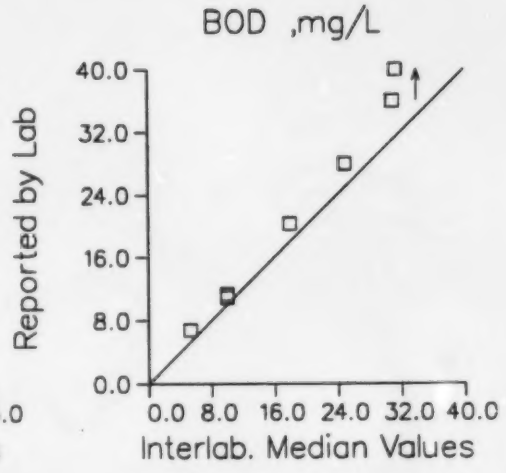


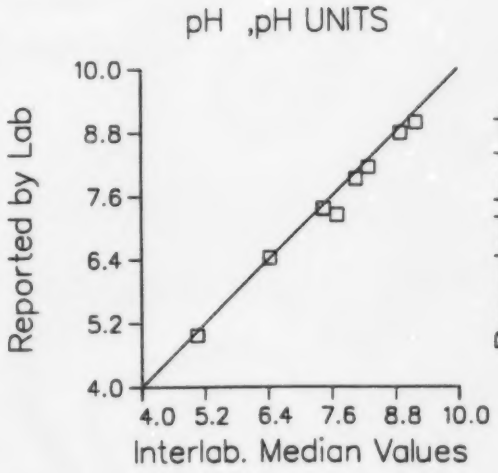
Lab Code: W0552

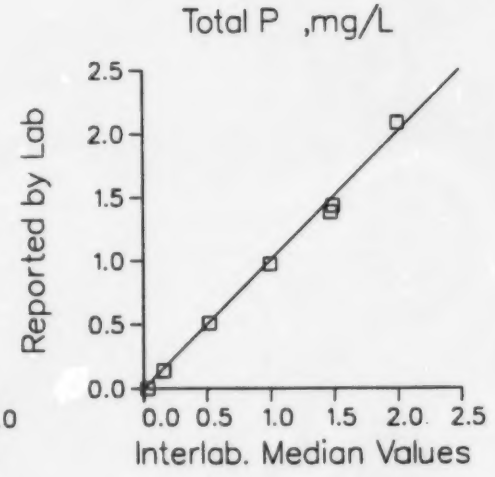
Laboratory: W0999

Comparison of Results Reported versus the Interlaboratory Median values









Lab Code: W0999

MOE/CAEAL Study, APPENDICES

Appendix 7: COMPARISON OF COMMERCIAL AND NON COMMERCIAL LABS

DATA SUMMARY FOR NON-COMMERCIAL LABS

MISA INTER LAB STUDY 01 SUSPENDED SOLIDS

PARAMETER: SUSPENDED SOLIDS MG/L

SAMPLE RESULTS

LAB	SS1	SS2	SS3	SS4	SS5	SB1	SB2	SB3	SB4
W0009	16.	32.	29.	19.	.0	45.	40.	58.	48.
W0023	14.	4.	26.	16.	2.	40.	36.	54.	42.
W0028	18.6	10.9	28.	18.6	.0	45.	38.6	44.4	58.
W0042	20.	10.	28.	20.	.0	48.	42.	62.	50.
W0127	17.	9.	26.	18.	.0	43.	36.	55.	43.
W0147	20.	11.	31.	22.	.0	47.	36.	65.	47.
W0148	21.	11.	31.	21.	.0	45.	40.	60.	44.
W0149	22.	12.	33.	23.	2.	46.	41.	60.	47.
W0179	16.5	9.	14.	36.5	.5	44.5	34.	56.5	44.
W0198	18.	6.	29.	14.	.0	43.	35.	57.	44.
W0211	20.	11.	30.	20.	.0	43.	36.	57.	42.
W0238	24.	12.	32.	22.	.0	49.	42.	62.	50.
W0239	19.	11.	26.	24.	.0	45.	42.	59.	39.
W0243	21.	11.7	31.5	20.	.0	43.	39.	56.	40.
W0247	20.	4.	22.	14.	.0	30.	30.	50.	30.
W0248	23.	13.	32.	22.	.0	51.	41.	64.	51.
W0255	27.	10.	31.	24.	-1.	35.	40.	56.	46.
W0266	21.	14.	31.	38.	4.	46.	39.	61.	45.
W0305	21.	12.	31.	21.	.0	44.	38.	59.	46.
W0335	16.	10.	31.	11.	.0	34.	28.	58.	44.
W0364	18.	10.	28.	19.	.0	43.	36.	55.	43.
W0370	20.	11.	28.	18.	1.	43.	36.	60.	46.
W0377	50.	42.	59.	46.	12.	34.	38.	82.	59.
W0380	19.	8.75	28.8	18.4	.0	46.8	33.6	38.4	50.4
W0390	21.0	11.4	32.4	22.0	.0	48.4	41.4	61.2	48.0
W0404	14.	18.	22.	17.	.0	38.	32.	50.	37.
W0427	21.	12.	33.	23.	.0	55.	48.	73.	54.
W0433	19.	12.	28.	19.	< 1.	39.	36.	54.	41.
W0441	21.	13.	29.	21.	.0	46.	38.	50.	45.
W0460	19.	10.	32.	21.	.0	50.	42.	60.	46.
W0477	20.	11.	30.	20.	.0	48.	39.	60.	47.
W0498	16.	6.	25.	15.	.0	44.	37.	61.	41.
W0529	23.	13.	30.	21.	.0	50.	46.	66.	48.
W0552	19.	10.	30.	20.	.0	46.	39.	46.	46.
TOTAL LABS REPORTING	34	34	34	34	34	34	34	34	34
TOTAL LABS USED	34	34	34	34	33	34	34	34	34
MEAN	20.44412	12.11029	29.63824	21.30882	.62121	44.05000	38.10588	57.95588	45.62941
STD DEV	5.88656	6.96922	6.42439	6.74992	2.21864	5.26672	4.07096	7.78410	5.51497
MEDIAN	20.00000	11.00000	30.00000	20.00000	.00000	45.00000	38.30000	58.50000	46.00000
DESIGN VALUES	22	12	29	22	blank	45	38	55	45

DATA SUMMARY FOR COMMERCIAL LABS

MISA INTER LAB STUDY 01 SUSPENDED SOLIDS

PARAMETER: SUSPENDED SOLIDS MG/L

SAMPLE RESULTS

LAB	SS1	SS2	SS3	SS4	SS5	SB1	SB2	SB3	SB4
W0072	24.	13.	34.	21.	1.	48.	42.	61.	50.
W0337	29.2	20.	38.8	30.	2.8	54.8	50.8	64.8	54.
W0390	21.0	11.4	32.4	22.0	.0	48.4	41.4	61.2	48.0
W0417	23.	9.	32.	24.	< 2.	46.	40.	60.	42.
W0418	18.	12.	27.	20.	< 5.	48.	41.	65.	48.
W0428	19.	10.	28.	19.	< 1.	44.	34.	52.	41.
W0429	17.	9.	31.	20.	< 1.	52.	48.	58.	43.
W0430	15.	6.	23.	14.	1.	45.	36.	55.	40.
W0431	20.	11.	32.	22.	< 5.	47.	40.	54.	57.
W0439	21.	7.	31.	22.	< 1.	36.	43.	41.	38.
W0447	24.	16.	33.	27.	4.	60.	41.	65.	35.
W0448	18.	12.	28.	21.	< 5.	45.	39.	58.	44.
W0456	15.	1.	31.	16.	< 1.	37.	17.	44.	37.
W0462	20.	26.	40.	21.	2.	56.	42.	98.	56.
W0463	20.	12.	30.	20.	.0	45.	37.	54.	44.
W0464	14.	11.	27.	15.	< 3.	38.	36.	55.	44.
W0468	20.	10.	26.5	16.	< .5	43.	39.	53.	49.
W0471	21.79	13.16	31.26	21.45	.11	47.28	42.25	62.23	49.64
W0476	19.	9.	26.	16.	< 1.	40.	36.	58.	39.
W0480	3.	12.	30.	21.	< 3.	47.	41.	61.	47.
W0482	20.	11.	29.	20.	< 1.	52.	40.	57.	47.
W0485	20.	11.	34.	18.	< 1.	50.	41.	63.	51.
W0489	19.6	11.2	28.6	19.8	.0	46.	37.2	56.8	45.4
W0493	16.	9.	20.	18.	< 2.	44.	44.	63.	48.
W0497	19.	11.	27.	22.	< 1.	47.	39.	61.	48.
W0506	20.	11.	30.	19.	< 1.	47.	39.	60.	46.
W0511	21.	12.	32.	20.	.0	48.	40.	62.	49.
W0514	21.	13.	32.	22.	.0	48.	82.	61.	46.
W0516	17.	9.	27.	18.	2.	46.	38.	59.	47.
W0524	20.	14.3	30.5	13.1	2.	45.	55.	75.	60.
W0526	16.4	12.9	28.4	23.2	.0	54.7	51.8	60.8	48.
W0528	20.	12.	28.	18.	< 2.	45.	37.	58.	45.
W0533	20.	12.	29.	16.	.0	49.	38.	61.	50.
W0535	20.6	12.	31.6	20.4	13.7	45.2	49.	60.6	35.8
W0538	20.	14.3	30.5	17.	.0	48.	53.	75.	61.
W0542	20.	12.	27.	20.	< 1.	40.	36.	57.	42.
W0551	13.	12.	29.	20.	< 1.	51.	32.	51.	42.
W0999	19.2	8.4	27.4	16.	.0	36.	38.5	58.	44.5
TOTAL LABS REPORTING	38	38	38	38	38	38	38	38	
TOTAL LABS USED	38	38	38	38	18	38	38	38	
MEAN	19.07342	11.54368	29.81474	19.70921	1.58944	46.56263	41.49868	59.98500	46.35105
STD DEV	3.97063	3.81244	3.65792	3.34478	3.25457	5.27651	9.37311	8.97998	6.07435
MEDIAN	20.00000	11.70000	30.00000	20.00000	.05500	47.00000	40.00000	60.00000	46.50000
DESIGN	22	12	29	22	blank	45	38	55	45

DATA SUMMARY FOR NON-COMMERCIAL LABS

MISA INTER LAB STUDY NO.02 BOD

PARAMETER: BIOCHEMICAL DEMAND MG/L

SAMPLE RESULTS

LAB	BOD1	BOD2	BOD3	BOD4	SB1	SB2	SB3	SB4
W0042	10.	5.	16.	8.	50.	37.	56.	50.
W0147	5.	2.	14.	6.	23.	20.	27.	24.
W0148	6.	4.	13.	7.	19.	17.	24.	22.
W0149	6.	3.	11.	5.	25.	16.	27.	25.
W0211	10.	7.	20.	11.	39.	29.	41.	37.
W0238	10.	7.	18.	10.	30.	23.	31.	31.
W0239	12.	8.	24.	11.	42.	31.	53.	45.
W0243	11.	12.	20.	11.	40.	30.	36.	40.
W0248	9.	6.	17.	11.	27.	19.	28.	30.
W0255	250.	40.	210.	210.	10.	60.		
W0335	8.	3.	8.	4.	35.	25.	.0	40.
W0364	10.	5.	18.	9.	32.	23.	28.	32.
W0404	9.	6.	12.	9.	23.	40.	48.	52.
W0427	7.2	3.4	12.0	7.2	24.6	18.9	31.5	22.8
W0433	7.	5.	16.	8.	35.	24.	37.	37.
W0441	9.	5.	18.	9.	30.	20.	34.	29.
W0460	8.	5.	16.	8.	26.	19.	29.	27.
W0477	9.	6.	17.	9.	37.	33.	37.	32.
W0498	10.	7.	19.	10.	28.	27.	34.	30.
W0529	18.	6.8	24.8	22.5	49.5	46.5	25.5	39.
W0552	10.	6.	20.	11.	35.	27.	41.	39.
TOTAL LABS REPORTING	21	21	21	21	21	21	21	21
TOTAL LABS USED	21	21	21	21	21	21	20	20
MEAN	20.67619	7.24762	25.89524	18.89048	31.43333	27.87619	33.40000	34.19000
STD DEV	52.61237	7.79972	42.38290	43.93816	9.72694	10.82760	11.90378	8.62590
MEDIAN	9.00000	6.00000	17.00000	9.00000	30.00000	25.00000	32.75000	32.00000
DESIGN VALUES	9	5	17	9	32	24	35	32

DATA SUMMARY FOR COMMERCIAL LABS

MISA INTER LAB STUDY NO.02 BOD

PARAMETER: BIOCHEMICAL DEMAND MG/L

SAMPLE RESULTS

LAB	BOD1	BOD2	BOD3	BOD4	SB1	SB2	SB3	SB4
W0072	6.	3.	14.	6.	25.	19.	27.	24.
W0337	9.	5.	19.	9.	26.	22.	31.	25.
W0417	9.	6.	20.	8.	33.	27.	41.	30.
W0418	7.	< 5.	11.	7.	27.	15.	24.	25.
W0428	4.	< 2.	14.	5.	32.	23.	35.	31.
W0429	12.	11.	25.	18.	36.	34.	57.	42.
W0430	8.7	5.4	17.5	10.	31.2	26.	37.	31.8
W0431	10.	6.	20.	8.	35.	26.	40.	34.
W0439	25.	3.8	31.	6.4	27.	23.	28.	31.
W0447	9.	5.	19.	8.	36.	25.	24.	30.
W0456	5.	1.	6.	1.	30.	16.	30.	30.
W0462	10.	6.	20.	10.	30.	25.	40.	32.
W0463	10.	5.	22.	10.	37.	29.	44.	37.
W0464	7.	3.	13.	6.	25.	21.	32.	27.
W0468	8.32	5.32	21.64	12.21	21.4	55.22	23.3	28.82
W0471	6.12	3.38	8.67	6.95	17.49	7.57	20.28	17.67
W0476	10.	6.	23.	11.	38.	28.	44.	36.
W0480	11.	6.	20.	11.	29.	24.	36.	30.
W0482	8.	5.	17.	10.	29.	26.	34.	30.
W0485	9.	6.	17.	12.	29.	39.	32.	47.
W0489	16.	5.8	15.7	10.7	57.6	48.5	74.	100.
W0493	10.	5.	17.	10.	31.	26.	35.	32.
W0497	10.	5.	19.	11.	38.	32.	42.	37.
W0506	10.	5.	19.	11.	30.	25.	35.	31.
W0511	10.	4.	14.	8.	33.	23.	34.	30.
W0514	5.	2.	16.	7.	27.	21.	33.	62.
W0516	10.	5.	19.	10.	36.	25.	22.	30.
W0524	12.	7.	20.	11.	36.	28.	42.	35.
W0526	9.5	6.9	15.6	10.2	34.5	30.5	33.	32.5
W0528	2.	2.	8.	9.	26.	21.	33.	26.
W0533	8.	5.	14.	9.	25.	25.	36.	28.
W0535	16.	7.	26.	6.	26.	24.	31.	30.
W0538	11.	6.	22.	11.	38.	27.	42.	34.
W0542	11.	6.	21.	11.	35.	28.	42.	36.
W0551	11.	7.	25.	12.	37.	29.	48.	32.
W0999	11.3	6.8	20.3	10.9	36.	28.	42.	40.
TOTAL LABS REPORTING	36	36	36	36	36	36	36	36
TOTAL LABS USED	36	34	36	36	36	36	36	36
MEAN	9.63722	5.21765	18.06694	9.26000	31.67194	26.43861	36.21056	34.29972
STD DEV	3.86105	1.81914	5.14845	2.82222	6.78080	8.31358	10.12326	13.42850
MEDIAN	10.00000	5.16000	19.00000	10.00000	31.10000	25.50000	35.00000	31.00000
DESIGN VALUES	9	5	17	9	32	24	35	32

DATA SUMMARY FOR NON-COMMERCIAL LABS

MISA INTER LAB STUDY NO.03 PH

PARAMETER: PH PH UNITS

SAMPLE RESULTS

LAB	PH1	PH2	PH3	PH4	PH5	PH6	PH7	PH8
W0009	7.46	5.15	8.46	7.80	8.95	9.00	8.09	6.45
W0010	7.25	5.0	8.15	7.55	8.65	9.15	7.9	6.3
W0017	7.51	5.00	7.80	7.50	8.48	8.94	7.62	6.28
W0021	7.4	5.1	8.4	8.0	9.0	9.5	8.1	6.4
W0023	7.30	5.05	8.35	7.45	8.95	9.07	7.80	6.28
W0028	7.45	5.9	8.5	7.61	8.95	9.45	8.25	6.6
W0042	7.30	5.00	8.10	7.70	8.72	9.50	8.00	6.40
W0127	7.37	5.00	7.68	7.48	8.84	9.02	8.04	6.38
W0147	7.46	4.95	8.58	8.09	9.15	9.75	8.17	6.41
W0148	7.36	4.98	8.44	7.61	9.07	9.42	7.87	6.39
W0149	7.47	5.04	8.51	7.50	8.99	9.37	8.40	6.48
W0179	7.5	5.1	8.44	7.4	8.9	9.3	8.0	6.5
W0190	7.43	5.10	8.45	7.68	8.97	9.20	8.07	6.45
W0198	7.64	5.25	8.57	7.89	9.11	9.70	8.25	6.57
W0211	7.47	5.08	7.92	7.57	8.64	9.02	7.80	6.44
W0233	7.4	5.0	7.9	7.3	8.4	8.9	7.2	6.2
W0238	7.45	5.10	8.50	7.75	9.0	9.50	8.05	6.45
W0239	6.73	4.87	8.5	7.69	8.71	9.18	7.91	5.84
W0247	7.50	5.15	8.40	8.00	9.00	9.00	8.20	6.60
W0248	7.75	5.25	8.20	7.10	9.00	9.20	7.90	6.60
W0255	7.45	5.00	8.07	7.45	8.73	8.80	7.77	6.39
W0266	7.36	5.15	8.02	7.49	8.46	8.86	8.06	6.44
W0305	7.36	5.15	8.02	7.49	8.46	8.86	8.06	6.44
W0335	7.5	5.1	7.8	7.4	8.6	8.9	7.6	6.5
W0336	7.67	5.17	8.52	7.65	8.98	9.54	7.97	6.46
W0364	7.50	5.1	8.1	7.7	8.8	7.9	7.9	6.4
W0370	7.4	5.0	8.6	7.5	8.8	9.0	7.8	6.4
W0377	7.4	5.2	8.4	8.0	8.9	9.2	7.7	6.4
W0380	7.52	5.28	8.31	8.18	9.08	9.42	8.35	6.55
W0382	7.4	5.0	8.2	7.7	8.7	8.8	8.2	6.6
W0389	7.45	5.08	8.37	7.80	9.00	9.58	8.12	6.45
W0404	7.4	5.0	8.2	7.1	9.0	9.0	7.6	6.3
W0427	7.29	4.99	8.03	7.57	8.70	9.24	7.72	6.38
W0433	7.44	5.01	8.06	7.70	8.76	8.89	7.89	6.39
W0441	7.56	5.03	8.82	8.32	9.50	10.17	8.36	6.41
W0460	7.46	5.01	8.36	8.02	9.00	9.52	8.05	6.41
W0477	7.45	5.01	8.21	8.00	8.9	9.3	8.13	6.42
W0498	7.37	4.97	7.80	7.30	8.61	8.95	7.54	6.35
W0529	7.46	5.07	8.47	8.02	9.01	9.57	8.21	6.46
W0552	7.50	4.98	8.40	7.86	9.06	9.63	8.21	6.42
TOTAL LABS REPORTING	40	40	40	40	40	40	40	40
TOTAL LABS USED	40	40	40	40	40	40	40	40
MEAN	7.42850	5.08425	8.26525	7.67300	8.86325	9.20750	7.97150	6.41475
STD DEV	.14952	.15953	.26616	.28029	.22343	.37714	.25294	.12991
MEDIAN	7.45000	5.04500	8.35500	7.66500	8.92500	9.20000	8.02000	6.41500
DESIGN VALUES	7.4	5.0	8.4	8.16	9.0	9.47	8.09	6.4

DATA SUMMARY FOR COMMERCIAL LABS

MISA INTER LAB STUDY NO.03 PH

PARAMETER: PH PH UNITS

SAMPLE RESULTS

LAB	PH1	PH2	PH3	PH4	PH5	PH6	PH7	PH8
WO072	7.45	5.00	8.30	7.90	8.90	9.40	8.25	6.45
WO337	7.42	5.06	8.13	7.68	8.79	9.30	8.01	6.40
WO417	7.40	4.90	8.14	7.52	8.80	9.16	7.57	6.33
WO418	7.47	5.05	8.54	8.00	9.09	9.60	8.29	6.39
WO428	7.5	5.1	8.5	8.1	9.1	9.6	8.2	6.5
WO429	7.44	4.99	8.24	7.45	8.91	8.26	8.06	6.39
WO431	7.24	5.04	8.09	7.47	8.68	8.73	7.86	6.33
WO439	7.17	5.12	8.21	7.90	8.74	9.29	8.21	6.59
WO447	7.5	5.0	8.2	7.8	8.8	9.3	7.7	6.4
WO448	7.44	5.04	8.38	7.60	8.96	9.19	8.24	6.45
WO456	7.63	5.12	8.28	7.85	9.07	9.46	8.00	6.62
WO462	7.48	5.02	8.50	8.01	9.07	9.62	8.15	6.44
WO463	7.43	5.05	8.48	8.06	9.06	9.52	8.27	6.47
WO464	7.4	5.0	8.3	8.0	9.0	9.4	8.1	6.5
WO468	7.54	5.06	8.57	8.28	9.12	9.00	8.35	6.44
WO469	7.474	5.067	8.505	8.088	9.048	9.401	8.246	6.420
WO471	7.26	5.60	7.77	7.35	8.25	8.60	7.44	6.55
WO476	7.45	5.06	8.26	7.92	8.93	9.07	8.10	6.45
WO480	7.42	5.04	8.36	7.95	8.89	9.41	8.13	6.42
WO482	7.42	5.08	8.09	7.56	8.69	8.78	7.99	6.43
WO489	7.43	5.03	8.28	7.69	8.80	9.41	8.16	6.48
WO493	7.47	5.03	8.48	8.02	9.04	9.56	8.15	6.43
WO497	7.43	5.05	8.43	7.63	8.96	9.26	8.16	6.44
WO506	7.60	5.40	8.25	8.00	8.90	9.00	8.40	6.80
WO511	7.50	5.15	8.25	7.75	8.85	9.20	7.75	6.45
WO514	7.42	5.06	8.35	7.74	9.01	9.20	8.28	6.40
WO515	7.54	4.94	8.16	7.24	8.81	9.13	7.48	6.34
WO516	7.48	5.10	8.42	8.05	8.93	9.01	8.38	6.44
WO524	7.46	5.01	7.95	7.40	8.61	8.87	7.90	6.38
WO526	7.42	5.04	8.37	7.91	8.91	9.08	8.23	6.42
WO528	7.47	5.07	8.45	7.98	9.05	9.60	8.05	6.50
WO533	7.31	5.49	7.65	7.11	8.25	8.46	7.40	6.45
WO535	7.39	5.00	8.30	7.93	8.88	9.38	8.09	6.37
WO538	7.38	5.01	7.86	7.27	8.55	8.80	7.84	6.27
WO542	7.458	5.051	8.431	8.154	9.004	9.420	8.286	6.417
WO551	7.47	5.05	8.47	7.62	9.03	9.28	8.17	6.44
WO999	7.37	4.97	8.15	7.25	8.79	8.99	7.93	6.43
TOTAL LABS REPORTING	37	37	37	37	37	37	37	37
TOTAL LABS USED	37	37	37	37	37	37	37	37
MEAN	7.43600	5.07697	8.27286	7.76303	8.87222	9.18219	8.04924	6.44397
STD DEV	.08811	.13727	.21349	.29713	.20665	.33029	.26299	.09025
MEDIAN	7.44000	5.05000	8.30000	7.85000	8.91000	9.26000	8.13000	6.44000
DESIGN VALUES	7.4	5.0	8.4	8.16	9.0	9.47	8.09	6.4

DATA SUMMARY FOR NON-COMMERCIAL LABS

MISA INTER LAB STUDY NO.04 TOT P

PARAMETER: TOTAL PHOSPHORUS-STP MG P/L

SAMPLE RESULTS

LAB	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8
W0009	2.05	1.01	1.54	1.49	.00	.50	.16	.15
W0017	1.0	.83	1.0	1.0	.0	.60	.14	.15
W0023	2.30	1.083	1.66	1.517	.830	.54	.15	.125
W0028	2.15	1.05	1.55	1.55	.025	.55	.15	.12
W0042	2.00	1.05	1.49	1.51	.07	.64	.20	.25
W0127	.92	.42	.68	.55	.10	.25	.05	< .01
W0147	1.80	.86	1.30	1.30	.08	.44	.14	.14
W0148	1.99	.97	1.49	1.43	.00	.51	.12	.14
W0149	2.21	1.06	1.85	1.52	.02	.57	.18	.20
W0179	.46	.56	.10	.11	.09	.02	.03	.00
W0198	.9	.8	.9	.9	.01	.5	.15	.16
W0211	2.07	1.00	1.50	1.47	.03	.50	.15	.13
W0233	2.00	1.00	1.50	1.42	.06	.56	.20	.16
W0238	2.12	1.19	1.77	1.74	.00	.61	.20	.21
W0239	2.25	1.0	1.5	1.58	.0	.53	.17	.12
W0243	2.01	1.15	1.57	1.64	.03	.65	.20	.16
W0247	1.80	.78	1.60	.70	.00	.00	.13	.10
W0248	2.25	.25	.67	.74	.00	.36	.03	.04
W0255	2.1	1.1	1.63	1.60	.06	.43	.16	.17
W0266	1.90	.99	1.44	1.44	.02	.46	.12	.15
W0305	1.90	.99	1.44	1.44	.02	.46	.12	.15
W0335	1.20	.83	.97	1.3	.0	.55	.32	.33
W0336	2.15	1.66	1.8	1.72	.50	1.07	.25	.20
W0337	2.23	1.10	1.62	1.59	.0	.58	.24	.21
W0364	1.936	1.016	1.408	1.536	.104	.327	.269	.267
W0370	2.0	.77	1.71	1.13	.02	.52	.07	.01
W0377	.9	.5	1.3	1.3	.07	.3	.2	.03
W0380	.9	.666	.766	.966	.16	.172	.08	.108
W0382	1.02	.83	1.16	.79	.02	.30	.07	.10
W0389	.16	.39	.99	.52	.00	.29	.09	.09
W0404	.76	.34	.50	1.06	.28	.42	.34	.32
W0427	1.94	1.18	1.60	1.53	.03	.62	.14	.17
W0433	2.01	1.11	1.64	1.63	.07	.61	.21	.26
W0441	2.03	.97	1.47	1.48	.01	.49	.18	.17
W0460	2.17	1.00	1.54	1.54	< .01	.52	.15	.17
W0477	2.20	1.163	1.683	1.663	.010	.590	.150	.210
W0498	2.52	2.00	1.66	1.70	.00	1.46	.72	.11
W0529	2.00	1.00	1.50	1.45	.01	.52	.16	.16
W0552	2.20	1.20	1.68	1.78	< .10	.80	.42	.20
TOTAL LABS REPORTING	39	39	39	39	39	39	39	39
TOTAL LABS USED	39	39	39	39	37	39	39	38
MEAN	1.75656	.94533	1.36351	1.31621	.07376	.50818	.17972	.15632
STD DEV	.59066	.32590	.39819	.39358	.15851	.24595	.11951	.07342
MEDIAN	2.00000	1.00000	1.50000	1.47000	.02000	.52000	.15000	.15500
DESIGN VALUES	2.0	1.03	1.56	1.54	blank	.54	.154	.156

DATA SUMMARY FOR COMMERCIAL LABS

MISA INTER LAB STUDY NO.04 TOT P

PARAMETER: TOTAL PHOSPHORUS-STP MG P/L

SAMPLE RESULTS

LAB	TP1	TP2	TP3	TP4		TP5	TP6		TP7		TP8
W0072	2.16	1.02	1.55	1.54	<	.02	.54		.17		.16
W0337	2.23	1.10	1.62	1.59		.0	.58		.24		.21
W0417	1.42	.92	1.20	1.19	<	.06	.51		.15		.15
W0418	1.99	1.02	1.54	1.48	<	.05	.54		.17		.18
W0428	2.12	1.18	1.68	1.76	<	.005	.752		.213		.199
W0429	1.96	1.00	1.46	1.45		.10	.56		.21		.24
W0431	2.18	1.04	1.50	1.53		.04	.54		.13		.12
W0439	1.7	.38	1.07	.66		5.1	.04		.83		4.95
W0447	1.87	1.11	1.30	1.63		.03	.52		.17		.16
W0448	2.19	1.04	1.58	1.58	<	.1	.56		.26		.17
W0456	2.48	1.07	1.79	1.82	<	.01	.56		.19		.16
W0462	2.23	1.03	1.59	1.55	<	.001	.576		.158		.172
W0463	2.16	1.02	1.62	1.67	<	.05	.526		.156		.136
W0464	.78	.33	.56	.62	<	.01	.23		.03		.05
W0468	1.03	.68	.86	.85	<	.001	.54		.14		.15
W0469	2.283	1.095	1.688	1.661		.075	.603		.377		.301
W0471	.45	.27	.23	.42	<	.01	.16		.05		.05
W0476	1.71	.812	1.26	1.23	<	.01	.452		.127		.124
W0480	1.98	.87	1.34	1.32	<	.10	.36	<	.10	<	.10
W0482	2.09	1.42	1.53	2.20		.16	.20		.05		.05
W0489	.45	.43	.54	.30		.05	.05		.05		.05
W0493	2.19	.98	1.62	1.65		.08	.43		.13		.17
W0497	2.36	1.19	1.79	1.75		.12	.65		.29		.31
W0506	2.10	1.10	1.60	1.45	<	.05	.50		.15		.17
W0511	2.43	1.23	1.78	1.79		.15	.71		.33		.34
W0514	1.50	.90	.90	1.23		.02	.30		.14		.14
W0515	2.16	.96	1.55	1.53	<	.1	.49		.14		.11
W0516	1.82	.94	1.37	1.43	<	.01	.44		.12		.19
W0524	2.13	1.22	1.62	1.53		.23	.60		.30		.32
W0526	2.16	1.09	1.40	1.40	<	.02	.58		.17		.17
W0528	1.10	.70	.94	.825		.004	.345		.1045		.0885
W0533	1.90	1.08	1.48	1.48	<	.05	.58		.16		.17
W0535	2.20	1.11	1.58	1.70		.01	.67		.158		.154
W0538	2.00	1.20	1.59	1.50		.11	.48		.19		.18
W0542	2.22	1.05	1.60	1.51	<	.03	.57		.16		.15
W0551	2.48	1.03	1.61	1.56		.01	.56		.19		.16
W0999	2.08	.97	1.43	1.38		.00	.51		.14		.14
TOTAL LABS REPORTING	37	37	37	37		37	37		37		37
TOTAL LABS USED	37	37	37	37		18	37		36		36
MEAN	1.89981	.96181	1.38832	1.39908		.34939	.48146		.18732		.29846
STD DEV	.52194	.25670	.36940	.40356		1.18738	.16720		.13330		.80049
MEDIAN	2.10000	1.03000	1.54000	1.51000		.06250	.54000		.15900		.16000
DESIGN VALUES	2.0	1.03	1.56	1.54		blank	.54		.154		.156

MOE/CAEAL Study, APPENDICES

Appendix 8: CORRESPONDENCE WITH LABS

Wastewater Technology Centre
Canada Centre for Inland Waters
P.O. Box 5050, 867 Lakeshore Rd.
Burlington, Ontario L7R 4A6

January 14, 1991

LAB CODE:

2075-3200-68800

Dear

Enclosed please find samples for determination of pH and Total Phosphorus as part of an interlaboratory comparison study carried out on behalf of the Ontario Ministry of the Environment. The study is administered through the Canadian Association for Environmental Analytical Laboratories (CAEAL) with technical assistance from the Wastewater Technology Centre (WTC) and the National Water Research Institute (NWRI).

Each bottle is labelled with a sample number which includes the parameter code PH or TP followed by a number ranging from 1 to 8. Please refer to this sample number when recording your results.

On each bottle label you will also find a bottle number which may range from 1 to 200. This indicates the order in which the bottles were filled. You do not need to refer to this number when recording your results.

The bottles contain the parameters indicated on the label in the following range of concentrations:

TP: 0-2 mg/L Total Phosphorus
PH: 5-9 pH units

Your results should be recorded on the attached sheets. Please include a brief description of the methods used including the date of analysis.

continued .../2

DATA SUMMARY

MISA INTER LAB STUDY NO.02 BOD
PRINTOUT PREPARED: 91/01/03.

PARAMETER: BIOCHEMICAL DEMAND MG/L

SAMPLE RESULTS

LAB	BOD1	BOD2	BOD3	BOD4	SB1	SB2	SB3	SB4
WOXXX	6.	4.	13.	7.	19.	17.	24.	22.
WO042	10.	5.	16.	8.	50.	37.	56.	50.
WO072	6.	3.	14.	6.	25.	19.	27.	24.
WO147	5.	2.	14.	6.	23.	20.	27.	24.
WO148	6.	4.	13.	7.	19.	17.	24.	22.
WO149	6.	3.	11.	5.	25.	16.	27.	25.
WO211	10.	7.	20.	11.	39.	29.	41.	37.
WO238	10.	7.	18.	10.	30.	23.	31.	31.
WO239	12.	8.	24.	11.	42.	31.	53.	45.
WO243	11.	12.	20.	11.	40.	30.	36.	40.
WO248	9.	6.	17.	11.	27.	19.	28.	30.
WO255	250.	40.	210.	210.	10.	60.		
WO335	8.	3.	8.	4.	25.	25.		40.
WO337	9.	5.	19.	9.	26.	22.	31.	25.
WO364	10.	5.	18.	9.	32.	23.	28.	32.
WO404	9.	6.	12.	9.	23.	40.	48.	52.
WO417	9.	6.	20.	8.	33.	27.	41.	30.
WO418	7. <	5.	11.	7.	27.	15.	24.	25.
WO427	7.2	3.4	12.0	7.2	24.6	16.9	31.5	22.8
WO428	4. <	2.	14.	5.	32.	23.	35.	31.
WO429	12.	11.	25.	18.	36.	34.	57.	42.
WO430	8.7	5.4	17.5	10.	31.2	26.	37.	31.8
WO431	10.	6.	20.	8.	35.	26.	40.	34.
WO433	7.	5.	16.	8.	35.	24.	37.	37.
WO441	9.	5.	18.	9.	30.	20.	34.	29.
WO456	5.	1.	6.	1.	30.	16.	30.	30.
WO460	8.	5.	16.	8.	26.	19.	29.	27.
WO462	10.	6.	20.	10.	30.	25.	40.	32.
WO463	10.	5.	22.	10.	37.	29.	44.	37.
WO464	7.	3.	13.	6.	25.	21.	32.	27.
WO468	8.32	5.32	21.64	12.21	21.4	55.22	23.3	28.82
WO471	6.12	3.38	8.67	6.95	17.49	7.57	20.28	17.67
WO476	10.	6.	23.	11.	38.	28.	44.	36.
WO477	9.	6.	17.	9.	37.	33.	37.	32.
WO480	11.	6.	20.	11.	29.	24.	36.	30.
WO482	8.	5.	17.	10.	29.	26.	34.	30.
WO485	9.	6.	17.	12.	29.	39.	32.	47.
WO489	16.	5.8	15.7	10.7	57.6	48.5	74.	100.
WO493	10.	5.	17.	10.	31.	26.	35.	32.
WO497	10.	5.	19.	11.	38.	32.	42.	37.
WO506	10.	5.	19.	11.	30.	25.	35.	31.
WO511	10.	4.	14.	8.	33.	23.	34.	30.
WO514	5.	2.	16.	7.	27.	21.	33.	62.
WO516	10.	5.	19.	10.	36.	25.	22.	30.
WO524	12.	7.	20.	11.	36.	28.	42.	35.
WO526	9.5	6.9	15.6	10.2	34.5	30.5	33.	32.5
WO528	2.	2.	8.	9.	26.	21.	33.	26.
WO529	18.	6.8	24.8	22.5	49.5	46.5	25.5	39.
WO533	8.	5.	14.	9.	25.	25.	36.	28.
WO535	16.	7.	26.	6.	26.	24.	31.	30.
WO538	11.	6.	22.	11.	38.	27.	42.	34.
WO542	11.	6.	21.	11.	35.	28.	42.	36.
WO551	11.	7.	25.	12.	37.	29.	40.	32.
WO552	10.	6.	20.	11.	35.	27.	41.	39.
WO999	11.3	6.8	20.3	10.9	36.	28.	42.	40.
TOTAL LABS REPORTING	55	55	55	55	55	55	55	55
TOTAL LABS USED	55	53	55	55	55	55	54	54
MEAN	13.51164	5.99623	20.69473	12.95745	31.42345	26.89436	35.36259	34.25167
STD DEV	32.60116	5.14515	26.39365	27.24394	8.17163	9.49721	10.92510	12.15359
MEDIAN	9.50000	5.32000	17.50000	10.00000	31.00000	25.00000	34.50000	31.90000

DATA SUMMARY

MISA INTER LAB STUDY 01 SOLIDS

PRINTOUT PREPARED: 91/01/03.

PARAMETER: SUSPENDED SOLIDS MG/L

SAMPLE RESULTS

LAB	SS1	SS2	SS3	SS4	SS5	SB1	SB2	SB3	SB4
W0009	16.	32.	29.	19.	2.0	45.	40.	58.	48.
W0023	14.6	10.9	28.	18.6	2.0	45.	38.6	54.4	47.
W0048	20.	10.	34.	20.	1.0	48.	42.	61.	50.
W0075	17.	13.	26.	18.	.0	47.	41.	60.	47.
W0127	20.	14.	31.	21.	.0	45.	40.	60.	44.
W0147	20.	14.	31.	21.	.0	46.	41.	59.	44.
W0148	21.	14.	31.	21.	2.0	46.	41.	59.	44.
W0178	16.5	9.	30.	16.5	.5	46.5	40.5	59.5	43.
W0198	18.	8.	30.	18.	.0	46.	40.	59.	43.
W0211	20.	14.	30.	20.	.0	46.	40.	59.	43.
W0238	21.	14.	32.	21.	.0	46.	40.	59.	43.
W0239	21.	11.7	31.5	21.	.0	46.	40.	59.	43.
W0247	20.	14.	32.	20.	.0	46.	40.	59.	43.
W0248	20.	13.	31.	20.	-1.	46.	40.	59.	43.
W0269	21.	14.	31.	21.	4.	46.	40.	59.	43.
W0296	21.	14.	31.	21.	.0	46.	40.	59.	43.
W0302	21.	14.	31.	21.	2.0	46.	40.	59.	43.
W0332	19.2	10.	30.8	20.	1.	46.8	40.8	59.8	43.
W0364	20.	14.	31.	20.	12.	46.	40.	59.	43.
W0370	20.	14.	31.	20.	.0	46.	40.6	59.4	50.4
W0377	20.	16.75	30.8	19.4	2.	46.8	40.	59.	43.
W0380	20.	14.	31.	20.	.0	46.	40.	59.	43.
W0394	20.	12.	31.	20.	5.	46.	40.	59.	43.
W0418	20.	14.	31.	20.	.0	46.	40.	59.	43.
W0428	20.	14.	31.	20.	1.	46.	40.	59.	43.
W0430	20.	14.	31.	20.	1.	46.	40.	59.	43.
W0431	20.	14.	31.	20.	1.	46.	40.	59.	43.
W0440	20.	14.	31.	20.	1.	46.	40.	59.	43.
W0456	20.	10.	31.	20.	.0	46.	40.	59.	43.
W0460	20.	14.	31.	20.	2.0	46.	40.	59.	43.
W0463	20.	14.	31.	20.	2.0	46.	40.	59.	43.
W0464	20.	14.	31.5	20.	3.5	46.	40.	59.	43.
W0468	20.	13.16	31.26	17.45	1.11	47.28	40.25	62.23	49.64
W0471	19.79	14.	31.	20.	1.0	46.	40.	59.	43.
W0476	20.	14.	31.	20.	3.	46.	40.	59.	43.
W0477	20.	14.	31.	20.	1.	46.	40.	59.	43.
W0480	20.	14.	31.	20.	1.	46.	40.	59.	43.
W0485	20.	14.	31.	20.	1.	46.	40.	59.	43.
W0489	19.6	11.2	30.6	19.8	1.0	46.	40.2	59.8	45.4
W0493	20.	14.	31.	20.	2.	46.	40.	59.	43.
W0497	20.	14.	31.	20.	1.	46.	40.	59.	43.
W0506	20.	14.	31.	20.	1.	46.	40.	59.	43.
W0511	20.	14.	31.	20.	.0	46.	40.	59.	43.
W0514	20.	13.3	30.5	19.1	2.	46.	40.	59.	43.
W0524	20.4	15.9	30.7	19.2	2.0	45.7	40.8	60.8	48.
W0526	20.	14.	31.	18.	2.0	46.	40.	59.	43.
W0528	20.	14.	31.	20.	.0	46.	40.	59.	43.
W0531	20.	14.	31.6	20.4	13.7	45.2	40.	60.6	45.8
W0535	20.6	13.3	30.5	20.	1.	46.	40.	59.	43.
W0538	20.	14.	31.	20.	1.	46.	40.	59.	43.
W0547	20.	15.	31.	20.	1.	46.	40.	59.	43.
W0552	20.	14.	30.	20.	.0	46.	40.	59.	46.
W0599	19.2	8.4	27.4	16.	.0	36.	38.5	58.	44.5

TOTAL LABS REPORTING	67	67	67	67	67	67	67	67	67.
TOTAL LABS USED	67	67	67	67	47	47	47	47	47
MEAN	19.65507	11.91955	29.65463	20.37985	.95979	45.22806	39.83209	59.11239	46.30955
STD DEV	5.10971	5.60136	5.23438	5.34174	2.70465	5.12772	7.76556	8.42313	5.71261
MEDIAN	20.00000	11.00000	30.00000	20.00000	.00000	46.00000	39.00000	59.00000	46.00000

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Wastewater Technology Centre
867 Lakeshore Road,
Burlington, Ontario
L7R 4A6

December 29, 1990

Dear Round Robin Participant:

Attached please find a summary of results for the BOD and Suspended Solids phase of the MOE/CAEAL Interlaboratory Study. Please check that your results have been correctly entered into the table. If you find any transcription errors, please contact the undersigned by phone (416-336-6482) or FAX (416-336-4765) as soon as possible. We expect that the final report will be available in April.

Thank you for your cooperation and we look forward to your participation in the next phase of the study.

Yours sincerely,

Peter Child

Peter Child, Ph.D.

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Wastewater Technology Centre
867 Lakeshore Road,
Burlington, Ontario
L7R 4A6

December 18, 1990

Dear Round Robin Participant:

This note is to remind you that the deadline for submission of results for the Suspended Solids and BOD portion of the MOE/CAEAL interlaboratory study is Friday, December 21. We cannot guarantee that results received after this point will be included in the final report.

We look forward to your continued participation and wish you a Merry Christmas and a Happy New Year.

Yours sincerely,

Peter Child

Peter Child, Ph.D.

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RESULTS REPORT FORM

TOTAL PHOSPHORUS:

Results:

Units	Sample Number							
	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8
mg/L								

Date Analysis Completed:

Methods:

Please provide a short description of the methods used.

pH:

Results:

Units	Sample Number							
	PH1	PH2	PH3	PH4	PH5	PH6	PH7	PH8
mg/L								

Date Analysis Completed:

Methods:

Please provide a short description of the methods used.

Please return this form before Thursday, January 31, 1991 to Dr. Peter Child by Fax at (416) 336-4765 or by mail to: Wastewater Technology Centre, 867 Lakeshore Road, Burlington, Ontario, L7R 4A6

For the purposes of this study, results should be reported to the following number of decimal places:

Phosphorus:	**two, for example; 1.37 mg/L**
pH:	**two, for example; 7.35 units (If your instruments record three decimal places, please feel free to report them)**

Your laboratory has been assigned a unique code number to ensure the confidentiality of your results. This code will be used in all future correspondence with your laboratory and in the subsequent reports.
Your results should be faxed or mailed to the address indicated on the results sheets by Thursday, January 31, 1991. A summary of the results from all participating labs, identified only by their code numbers, will be mailed to you shortly afterwards. At this time you will have an opportunity to check any data entry errors that may have occurred at our end. We regret that we will not be able to change the results submitted to us from your laboratory at this time. A final report of the entire interlaboratory comparison will be mailed to you in late April, 1991.

Should you require any assistance please contact Dr. Peter Child at (416)336-6428 or Mr. Jim Fraser at (416)336-4719.

Yours sincerely,

Peter Child
Telphone: (416)336-6428
Fax: (416)336-4765

Wastewater Technology Centre
Canada Centre for Inland Waters
P.O. Box 5050, 867 Lakeshore Rd.
Burlington, Ontario L7R 4A6

November 19, 1990

LAB CODE: 1"

2"

3"
4"
5"

Dear 6":

Enclosed please find samples for determination of pH and Total Phosphorus as part of an interlaboratory comparison study carried out on behalf of the Ontario Ministry of the Environment. The study is administered through the Canadian Association for Environmental Analytical Laboratories (CAEAL) with technical assistance from the Wastewater Technology Centre (WTC) and the National Water Research Institute (NWRI).

Each bottle is labelled with a sample number which includes the parameter code PH or TP followed by a number ranging from 1 to 8. Please refer to this sample number when recording your results.

On each bottle label you will also find a bottle number which may range from 1 to 200. This indicates the order in which the bottles were filled. You do not need to refer to this number when recording your results.

The bottles contain the parameters indicated on the label in the following range of concentrations:

TP:	0-2 mg/L Total Phosphorus
PH:	5-9 pH units

Your results should be recorded on the attached sheets. Please include a brief description of the methods used including the date of analysis.

continued .../2

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RESULTS REPORT FORM

TOTAL PHOSPHORUS:

Results:

Units	Sample Number							
	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8
mg/L								

Date Analysis Completed:

Methods:

Please provide a short description of the methods used.

pH:

Results:

Units	Sample Number							
	PH1	PH2	PH3	PH4	PH5	PH6	PH7	PH8
mg/L								

Date Analysis Completed:

Methods:

Please provide a short description of the methods used.

Please return this form before Thursday, January 31, 1991 to Dr. Peter Child by Fax at (416) 336-4765 or by mail to: Wastewater Technology Centre, 867 Lakeshore Road, Burlington, Ontario, L7R 4A6

For the purposes of this study, results should be reported to the following number of decimal places:

Phosphorus:	two, for example; 1.37 mg/L
pH:	two, for example; 7.35 units (If your instruments record three decimal places, please feel free to report them)

Your laboratory has been assigned a unique code number to ensure the confidentiality of your results. This code will be used in all future correspondence with your laboratory and in the subsequent reports.

Your results should be faxed or mailed to the address indicated on the results sheets by **Thursday, January 31, 1991**. A summary of the results from all participating labs, identified only by their code numbers, will be mailed to you shortly afterwards. At this time you will have an opportunity to check any data entry errors that may have occurred at our end. We regret that we will not be able to change the results submitted to us from your laboratory at this time. A final report of the entire interlaboratory comparison will be mailed to you in late April, 1991.

Should you require any assistance please contact Dr. Peter Child at (416)336-6428 or Mr. Jim Fraser at (416)336-4719.

Yours sincerely,

Peter Child

Peter Child
Telphone: (416)336-6428
Fax: (416)336-4765

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Wastewater Technology Centre
867 Lakeshore Road,
Burlington, Ontario
L7R 4A6

February 8, 1991

Dear Round Robin Participant:

Attached please find a summary of results for the pH and Total Phosphorus phase of the MOE/CAEAL Interlaboratory Study. Please check that your results have been correctly entered into the table. If you find any transcription errors, please contact the undersigned by phone (416-336-6428) or FAX (416-336-4765). If you have not yet sent in your results, please do so as soon as possible. Our final cutoff date for inclusion of data into the final report will be February 28, 1991. We expect that the report will be available in April.

Thank you for your cooperation.

Yours sincerely,

Peter Child, Ph.D.

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MISA INTER LAB STUDY NO.04 TOT P

PRINTOUT PREPARED: 91/02/12.

PARAMETER: TOTAL PHOSPHORUS-STP MG P/L

SAMPLE RESULTS

LAB	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8
W0009	2.05	1.01	1.54	1.49	.00	.50	.16	.15
W0017	1.0	.83	1.0	1.0	.0	.60	.14	.15
W0023	2.30	1.083	1.66	1.517	.830	.54	.15	.125
W0028	2.15	1.05	1.55	1.55	.025	.55	.15	.12
W0042	2.00	1.05	1.49	1.51	.07	.64	.20	.25
W0072	2.16	1.02	1.55	1.54	< .02	.54	.17	.16
W0127	.92	.42	.68	.55	.10	.25	.05	< .01
W0147	1.80	.86	1.30	1.30	.08	.44	.14	.14
W0148	1.99	.97	1.49	1.43	.00	.51	.12	.14
W0149	2.21	1.06	1.85	1.52	.02	.57	.18	.20
W0179	.46	.56	.10	.11	.09	.02	.03	.00
W0198	.9	.8	.9	.9	.01	.5	.15	.16
W0211	2.07	1.00	1.50	1.47	.03	.50	.15	.13
W0233	2.00	1.00	1.50	1.42	.06	.56	.20	.16
W0239	2.25	1.0	1.5	1.58	.0	.53	.17	.12
W0243	2.01	1.15	1.57	1.64	.03	.65	.20	.16
W0247	1.80	.78	1.60	.70	.00	.00	.13	.10
W0248	2.25	.25	.67	.74	.00	.36	.03	.04
W0255	2.1	1.1	1.63	1.60	.06	.43	.16	.17
W0266	1.90	.99	1.44	1.44	.02	.46	.12	.15
W0305	1.90	.99	1.44	1.44	.02	.46	.12	.15
W0335	1.20	.83	.97	1.3	.0	.55	.32	.33
W0336	2.15	1.66	1.8	1.72	.50	1.07	.25	.20
W0337	2.23	1.10	1.62	1.59	.0	.58	.24	.21
W0364	1.936	1.016	1.408	1.536	.104	.327	.269	.267
W0370	2.0	.77	1.71	1.13	.02	.52	.07	.01
W0377	.9	.5	1.3	1.3	.07	.3	.2	.03
W0380	.9	.666	.766	.966	.16	.172	.08	.108
W0382	1.02	.83	1.16	.79	.02	.30	.07	.10
W0389	.16	.39	.99	.52	.00	.29	.09	.09
W0404	.76	.34	.50	1.06	.28	.42	.34	.32
W0417	1.42	.92	1.20	1.19	< .06	.51	.15	.15
W0418	1.99	1.02	1.54	1.48	< .05	.54	.17	.18
W0427	1.94	1.18	1.60	1.53	.03	.62	.14	.17
W0428	2.12	1.18	1.68	1.76	< .005	.752	.213	.199
W0429	1.96	1.00	1.46	1.45	.10	.56	.21	.24
W0431	2.18	1.04	1.50	1.53	.04	.54	.13	.12
W0433	2.01	1.11	1.64	1.63	.07	.61	.21	.26
W0439	1.7	.38	1.07	.66	5.1	.04	.83	4.95
W0441	2.03	.97	1.47	1.48	.01	.49	.18	.17
W0447	1.87	1.11	1.30	1.63	.03	.52	.17	.16
W0448	2.19	1.04	1.58	1.58	< .1	.56	.26	.17
W0456	2.48	1.07	1.79	1.82	< .01	.56	.19	.16
W0460	2.17	1.00	1.54	1.54	< .01	.52	.15	.17
W0462	2.23	1.03	1.59	1.55	< .001	.576	.158	.172
W0463	2.16	1.02	1.62	1.67	< .05	.526	.156	.136
W0464	.78	.33	.56	.62	< .01	.23	.03	.05
W0468	1.03	.68	.86	.85	< .001	.54	.14	.15
W0469	2.283	1.095	1.688	1.661	.075	.603	.377	.301
W0471	.45	.27	.23	.42	< .01	.16	.05	.05

MISA INTER LAB STUDY NO.04 TOT P

PRINTOUT PREPARED: 91/02/12.

PARAMETER: TOTAL PHOSPHORUS-STP MG P/L

SAMPLE RESULTS

LAB	TP1	TP 2	TP3	TP4	TP5	TP 6	TP 7	TP 8
WO476	1.71	.812	1.26	1.23	< .01	.452	.127	.124
WO477	2.20	1.163	1.683	1.663	.010	.590	.150	.210
WO480	1.98	.87	1.34	1.32	< .10	.36	< .10	< .10
WO482	2.09	1.42	1.53	2.20	.16	.20	.05	.05
WO489	.45	.43	.54	.30	.05	.05	.05	.05
WO493	2.19	.98	1.62	1.65	.08	.43	.13	.17
WO497	2.36	1.19	1.79	1.75	.12	.65	.29	.31
WO498	2.52	2.00	1.66	1.70	.00	1.46	.72	.11
WO506	2.10	1.10	1.60	1.45	< .05	.50	.15	.17
WO511	2.43	1.23	1.78	1.79	.15	.71	.33	.34
WO514	1.50	.90	.90	1.23	.02	.30	.14	.14
WO515	2.16	.96	1.55	1.53	< .1	.49	.14	.11
WO516	1.82	.94	1.37	1.43	< .01	.44	.12	.19
WO524	2.13	1.22	1.62	1.53	.23	.60	.30	.32
WO526	2.16	1.09	1.40	1.40	< .02	.58	.17	.17
WO528	1.10	.70	.94	.825	.004	.345	.1045	.0885
WO529	2.00	1.00	1.50	1.45	.01	.52	.16	.16
WO533	1.90	1.08	1.48	1.48	< .05	.58	.16	.17
WO535	2.20	1.11	1.58	1.70	.01	.67	.158	.154
WO538	2.00	1.20	1.59	1.50	.11	.48	.19	.18
WO542	2.22	1.05	1.60	1.51	< .03	.57	.16	.15
WO551	2.48	1.03	1.61	1.56	.01	.56	.19	.16
WO552	2.20	1.20	1.68	1.78	< .10	.80	.42	.20
TOTAL LABS REPORTING	73	73	73	73	73	73	73	73
TOTAL LABS USED	73	73	73	73	52	73	72	71
MEAN	1.81327	.94788	1.36610	1.34778	.17342	.49223	.18295	.22711
STD DEV	.56677	.29658	.38594	.40263	.70997	.21400	.12784	.57312
MEDIAN	2.00000	1.00000	1.50000	1.48000	.03000	.52000	.15800	.16000

MISA INTER LAB STUDY NO.03 PH

PRINTOUT PREPARED: 91/02/12.

PARAMETER: PH PH UNITS

SAMPLE RESULTS

LAB	PH1	PH2	PH3	PH4	PH5	PH6	PH7	PH8
WO009	7.46	5.15	8.46	7.80	8.95	9.00	8.09	6.45
WO010	7.25	5.0	8.15	7.55	8.65	9.15	7.9	6.3
WO017	7.51	5.00	7.80	7.50	8.48	8.94	7.62	6.28
WO021	7.4	5.1	8.4	8.0	9.0	9.5	8.1	6.4
WO023	7.30	5.05	8.35	7.45	8.95	9.07	7.80	6.28
WO028	7.45	5.9	8.5	7.61	8.95	9.45	8.25	6.6
WO042	7.30	5.00	8.10	7.70	8.72	9.50	8.00	6.40
WO072	7.45	5.00	8.30	7.90	8.90	9.40	8.25	6.45
WO127	7.37	5.00	7.68	7.48	8.84	9.02	8.04	6.38
WO147	7.46	4.95	8.58	8.09	9.15	9.75	8.17	6.41
WO148	7.36	4.98	8.44	7.61	9.07	9.42	7.87	6.39
WO149	7.47	5.04	8.51	7.50	8.99	9.37	8.40	6.48
WO179	7.5	5.1	8.44	7.4	8.9	9.3	8.0	6.5
WO190	7.43	5.10	8.45	7.68	8.97	9.20	8.07	6.45
WO198	7.64	5.25	8.57	7.89	9.11	9.70	8.25	6.57
WO211	7.47	5.08	7.92	7.57	8.64	9.02	7.80	6.44
WO233	7.4	5.0	7.9	7.3	8.4	8.9	7.2	6.2
WO239	6.73	4.87	8.5	7.69	8.71	9.18	7.91	5.84
WO247	7.50	5.15	8.40	8.00	9.00	9.00	8.20	6.60
WO248	7.75	5.25	8.20	7.10	9.00	9.20	7.90	6.60
WO255	7.45	5.00	8.07	7.45	8.73	8.80	7.77	6.39
WO266	7.36	5.15	8.02	7.49	8.46	8.86	8.06	6.44
WO305	7.36	5.15	8.02	7.49	8.46	8.86	8.06	6.44
WO335	7.5	5.1	7.8	7.4	8.6	8.9	7.6	6.5
WO336	7.67	5.17	8.52	7.65	8.98	9.54	7.97	6.46
WO337	7.42	5.06	8.13	7.68	8.79	9.30	8.01	6.40
WO364	7.50	5.1	8.1	7.7	8.8	7.9	7.9	6.4
WO370	7.4	5.0	8.6	7.5	8.8	9.0	7.8	6.4
WO377	7.4	5.2	8.4	8.0	8.9	9.2	7.7	6.4
WO380	7.52	5.28	8.31	8.18	9.08	9.42	8.35	6.55
WO382	7.4	5.0	8.2	7.7	8.7	8.8	8.2	6.6
WO389	7.45	5.08	8.37	7.80	9.00	9.58	8.12	6.45
WO404	7.4	5.0	8.2	7.1	9.0	9.0	7.6	6.3
WO417	7.40	4.90	8.14	7.52	8.80	9.16	7.57	6.33
WO418	7.47	5.05	8.54	8.00	9.09	9.60	8.29	6.39
WO427	7.29	4.99	8.03	7.57	8.70	9.24	7.72	6.38
WO428	7.5	5.1	8.5	8.1	9.1	9.6	8.2	6.5
WO429	7.44	4.99	8.24	7.45	8.91	8.26	8.06	6.39
WO431	7.24	5.04	8.09	7.47	8.68	8.73	7.86	6.33
WO433	7.44	5.01	8.06	7.70	8.76	8.89	7.89	6.39
WO439	7.17	5.12	8.21	7.90	8.74	9.29	8.21	6.59
WO441	7.56	5.03	8.82	8.32	9.50	10.17	8.36	6.41
WO447	7.5	5.0	8.2	7.8	8.8	9.3	7.7	6.4
WO448	7.44	5.04	8.38	7.60	8.96	9.19	8.24	6.45
WO456	7.63	5.12	8.28	7.85	9.07	9.46	8.00	6.62
WO460	7.46	5.01	8.36	8.02	9.00	9.52	8.05	6.41
WO462	7.48	5.02	8.50	8.01	9.07	9.62	8.15	6.44
WO463	7.43	5.05	8.48	8.06	9.06	9.52	8.27	6.47
WO464	7.4	5.0	8.3	8.0	9.0	9.4	8.1	6.5

MISA INTER LAB STUDY NO.03 PH

PRINTOUT PREPARED: 91/02/12.

PARAMETER: PH PH UNITS

SAMPLE RESULTS

LAB	PH 1	PH 2	PH 3	PH4	PH5	PH6	PH 7	PH 8
W0468	7.54	5.06	8.57	8.28	9.12	9.00	8.35	6.44
W0469	7.474	5.067	8.505	8.088	9.048	9.401	8.246	6.420
W0471	7.26	5.60	7.77	7.35	8.25	8.60	7.44	6.55
W0476	7.45	5.06	8.26	7.92	8.93	9.07	8.10	6.45
W0477	7.45	5.01	8.21	8.00	8.9	9.3	8.13	6.42
W0480	7.42	5.04	8.36	7.95	8.89	9.41	8.13	6.42
W0482	7.42	5.08	8.09	7.56	8.69	8.78	7.99	6.43
W0489	7.43	5.03	8.28	7.69	8.80	9.41	8.16	6.48
W0493	7.47	5.03	8.48	8.02	9.04	9.56	8.15	6.43
W0497	7.43	5.05	8.43	7.63	8.96	9.26	8.16	6.44
W0498	7.37	4.97	7.80	7.30	8.61	8.95	7.54	6.35
W0506	7.60	5.40	8.25	8.00	8.90	9.00	8.40	6.80
W0511	7.50	5.15	8.25	7.75	8.85	9.20	7.75	6.45
W0514	7.42	5.06	8.35	7.74	9.01	9.20	8.28	6.40
W0515	7.54	4.94	8.16	7.24	8.81	9.13	7.48	6.34
W0516	7.48	5.10	8.42	8.05	8.93	9.01	8.38	6.44
W0524	7.46	5.01	7.95	7.40	8.61	8.87	7.90	6.38
W0526	7.42	5.04	8.37	7.91	8.91	9.08	8.23	6.42
W0528	7.47	5.07	8.45	7.98	9.05	9.60	8.05	6.50
W0529	7.46	5.07	8.47	8.02	9.01	9.57	8.21	6.46
W0533	7.31	5.49	7.65	7.11	8.25	8.46	7.40	6.45
W0535	7.39	5.00	8.30	7.93	8.88	9.38	8.09	6.37
W0538	7.38	5.01	7.86	7.27	8.55	8.80	7.84	6.27
W0542	7.458	5.051	8.431	8.154	9.004	9.420	8.286	6.417
W0551	7.47	5.05	8.47	7.62	9.03	9.28	8.17	6.44
W0552	7.50	4.98	8.40	7.86	9.06	9.63	8.21	6.42
TOTAL LABS REPORTING	75	75	75	75	75	75	75	75
TOTAL LABS USED	75	75	75	75	75	75	75	75
MEAN	7.43269	5.08197	8.26741	7.72203	8.86683	9.19401	8.00936	6.42849
STD DEV	.12457	.14974	.24209	.28892	.21630	.35549	.26235	.11434
MEDIAN	7.45000	5.05000	8.30000	7.70000	8.91000	9.20000	8.06000	6.43000